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The Second Wave

THE practical outcome of the new electric cooking and water-heating campaign that has been started in many newspapers during the past week depends very largely upon the measure of active support that it receives from electricity supply men.

The "Wizard in the Wall" Press advertising campaign of last autumn was arranged by E.D.A. after consultation with its publicity advisers. It was designed to awaken the nation to the advantages of electrification; to increase electrical consciousness; to remove prejudice; and to pave the way for more intense electrical selling by specialised propaganda schemes.

That was described as the beginning of a great electrical offensive. What it actually accomplished nobody is able to judge, for its results can only be gauged as later parts of the programme of campaign make progress.

The cooking and water-heating activity which began last week may be described, we suppose, as the second stage. A series of illustrated advertisements will appear in the Press during the next five months. Copies have been circulated to authorities who are members, who will judge for themselves the potential effectiveness of the human appeal which they express.

Their chief objective seems to be to induce the public to make application at their electricity showroom or through the post for a copy of a booklet entitled "This Wonderful Age." In the literature they will read the general statement of the electrical case; at the showroom they will state details and ask for hard facts and figures upon which they may decide for or against.

The booklet is also intended for prominent display in showroom windows, while the series of advertisement designs is commended for reproduction in local papers that have not been so fortunate as to be selected by the official publicity advisers.

The preparation of matter to appeal to the public mind and fix lasting impressions upon it is quite a gamble. Some of the advertisements are no doubt well suited for the purpose, but you cannot please all of the people everywhere in the same way or catch all kinds of fish by the same means. There will have to be a lot of local effort everywhere.

We hope that the booklet will be read by those for whom it has been written. Sir William Ray opens it with a "foreword" which is officially described as "a spirited article," though we fear that the spirit has flown from our copy in transit. Officially, also, it is intended for use by electricity supply authorities who wish to buy it at £8 per 1,000 copies for distribution, and it is described as an "attractively designed, interesting, and valuable book."

This can well be believed if it is regarded from the correct viewpoint, but whether it is sure of a long life in the home and therefore likely to be read and re-read again and again because it contains a number of recipes we prefer to let the ladies decide; are they not already surfeited with matter of this kind in their ordinary magazines, from which they cut out items that particularly appeal to them?

For the sake of the industry we wish this new effort increasing success during its run. We pass on to electricity authorities, whether members of E.D.A. or not, the suggestion that they shall see that every one of their potential consumers of the domestic class covered by the scheme receives a copy. We further agree that if the enthusiastic co-operation of directors, chief engineers, managers, and salesmen can be secured it will be of inestimable value. Without it we cannot make progress as we wish to do.

The Discharge-Lamp Spectrum

WE have closely followed the development of the discharge lamp from the initial installation at Wembley in July, 1932. We have also noted the gradual improvement in its spectrum and the methods adopted to correct its deficiency in red rays. A Sussex paper, referring to the "Sieray" lamps at Brighton, expressed the view that the colour of the light would make them unsuitable for use on the sea front. The article was out of date before it was

written, for Mr. J. N. Aldington only the day before had demonstrated to us the qualities of his invention, the "Sieray W" lamp, in which the somewhat unexpected feat of blending rare gases so as to obtain the requisite qualities of each has been performed. The new lamp more than justifies the hope Mr. Aldington held out in the article he contributed to our issue of December 8th, as he informs us that the spectrum is, for all practical purposes, controllable. We have compared the overall costs of public lighting by discharge and filament lamps, and find that even with a charge of ½d. per kWh there is a substantial saving.

This Year's Fair

By all accounts the 1934 British Industries Fair will mark a continuance of the advance which the past few years have witnessed. This applies particularly to the Electrical Section at Birmingham. Although there are still a number of leading electrical manufacturers who consider that it is not worth their while to participate, there has been a further growth in the size of the Section. Last year eighty-six concerns occupied a space of 28,000 sq. ft.; this year the number has risen to 126 and the space taken to 46,000 sq. ft. There has been an improvement in the layout of the stands which should aid both exhibitors and visitors to get the best out of the display. All of the leading associations of the industry are again to pay official visits; as will be seen from the list of functions on another page, the principal "electrical" days are the two Thursdays, February 22nd and March 1st, and we hope that as many of our readers as possible will endeavour to join in. Our next issue will contain an illustrated guide to the electrical exhibits at Birmingham which should prove useful to visitors and of interest, also, to those who are unable to attend the Fair.

Institution Honours

In conferring upon Sir Frank E. Smith the Faraday Medal, the highest award within its power to bestow, the Institution of Electrical Engineers has demonstrated the catholic views of its members as to the interdependence of different aspects of science. Sir Frank is not a member of the Institution, but all who heard him deliver the last Kelvin Lecture will realise that we owe a debt to him as a distinguished scientist. The Institution has added to its prestige also in gaining as an honorary member that eminent Swiss engineer Dr. René Thury, who is known to all of us for his work, dating right back to the early 'eighties, as a pioneer of d.c. high-voltage transmission.

Blizzards and Overhead Lines

An appendix to the new report of the Electricity Supply Board of the Irish Free State gives particulars of the effect on overhead lines of the blizzard last February. This should be compared with a corresponding section in the last report of the Electricity Commissioners. In Southern Ireland the mean hourly wind velocity reached 68 m.p.h. with gusts of over 100 m.p.h., as against 54 and 73 m.p.h. in this country. The damage was considerably greater, as many masts were broken and conductor breakages were far more numerous, although the major cause of interruption in supply here—the falling of P.O. lines on to power lines—was apparently not experienced. How far the trouble would have been mitigated if the regulations had been more on the lines of those in force here is debatable, as the conditions were much more severe, but the Supply Board has had to spend appreciable sums on reconstruction.

Automatic Boiler Control

The promise of immediate savings is usually the easiest way of securing acceptance of a scheme, even if its primary objective be quite different. Messrs. J. L. Hodgson and L. L. Robinson in their paper before the Institution of Mechanical Engineers did well to emphasise that automatic control of combustion was first introduced to prevent smoke and to maintain steam pressure without constant attention. If the system also reduces operating costs so much the better, and considerable claims have been made on this score. The real criterion is the improvement gained in the same station under the same conditions, and we are more impressed by the increase in efficiency at Hackney due to automatic control than by being told that many more conventional stations give higher thermal efficiencies. Yet Kirkstall does very well in leading the stations with outputs of from fifty to one hundred million kWh with 24.2 per cent. Automatic combustion control, even if operating savings are only enough to balance additional capital charges in the initial stages, provides one of those departures from precedent by which stagnation is prevented, and in which, as engineering experience shows, opportunities for progress are to be found.

Accidents in Mines

The value of statistics depends upon the ability to relate them to other sets of figures. Thus, the preliminary statement of the number of deaths caused by accidents in and about the mines and quarries of Great Britain (Stationery Office, 2d.) shows that fifteen men were killed in coal mines in 1933 due to electricity. The document also shows that the total number of fatalities was 881. This proportion is very small considering the extent to which electricity is used in dangerous positions, and no statistics can indicate what the increase in the total number would have been but for the use of electricity. In metalliferous mines and quarries, where fifty-four deaths were recorded, electricity has a completely clean sheet.

Another Electricity Bill

The Electricity (Supply) Bill which obtained a second reading in the House of Commons last week is designed to remove a number of disabilities under which supply undertakings labour at present, and therefore to save expense. As it has the approval of the Electricity Commissioners and the Government, it would appear that it stands a fair chance of becoming law, after being suitably amended in Committee. Whether because they desire to follow a similar course in their own business, or because they think that there are hidden "snags" for electricity in the Bill, the "great gas companies" were said to have given the measure their approval.

Students' Meetings

The London Students' Section of the Institution of Electrical Engineers is served by energetic and enthusiastic honorary officials who devote their spare time to doing what they can to ensure that corporate members of the future may be worthy of their predecessors and of their fine profession as a whole. We should like to see more recognition by the students themselves of the importance of their section. The attendance at meetings appears to be lower than it was at the opening of the present session, despite the interest of the papers read. We hope full support will be forthcoming for the varied and attractive programme that has been arranged for the second half of this session. Competition with students of the other engineering institutions for the Young Trophy should do much towards engendering the right team spirit.

Training—and After

Possibly students might feel that there was a greater inducement to support their section if they saw that closer relationship between their colleges and their subsequent employers to which Prof. Cramp referred again at the contractors' dinner at Birmingham last week. One cannot help having sympathy for the young man who has worked hard through his college and works courses and when fully qualified finds himself compelled to accept a workman's job at so much per hour.

How Lighting Glassware is Produced (See page 185)

1. Sifting and mixing the raw materials at the Duroglass works. 2. Gathering glass. 3. The initial blowing. 4. Blowing the glass into the mould. 5. The moulded fitting. 6. The annealing process. 7. Cutting off the waste glass. 8. Removing the rough edges. 9. Acid bath for producing a satin finish. 10. A sandblasting machine. 11. Spraying on a design

Reactive kVA Meters. By A. G. Powell

WHERE a supply tariff includes a power factor clause, the usual method of determining the average power factor is to employ, in addition to the normal watt-hour meter, a reactive kVA-hour meter. The average power factor can then be calculated, and is equal to

$$\text{kWh}/\sqrt{\text{kWh}^2+\text{reactive kVAh}^2}.$$

The two principal methods of measuring reactive kVA- hours are (1) by an ordinary watt-hour meter with voltages applied to the potential coils at the necessary phase angles to make the total torque proportional to $\sqrt{3}$ VI sin ϕ; and (2) by a special meter which may be of the split-current coil type, or employ other means to obtain the required voltage/current relationship.

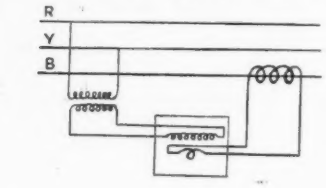
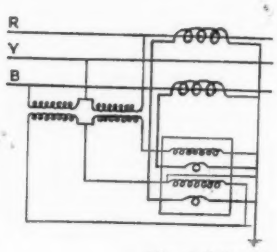


Fig. 1 (above).



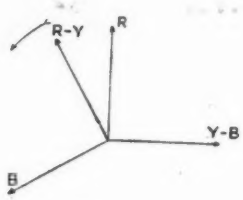


Fig. 2 (below).

The simplest method applicable to a three-phase circuit is to use a single-phase meter connected as in fig. 1. This method is only accurate where the load and phase voltages are balanced, and is therefore limited in its application. The vector diagram shows that with unity power factor the current and voltage vectors are in quadrature, and the torque exerted on the meter disc is therefore nil. The torque on the disc will vary according to VI *cos* $(90-\phi)=$VI sin ϕ, and the registration of the meter must therefore be multiplied by $\sqrt{3}$, or this factor may be allowed for in the meter gearing. Provided that a voltage lagging behind the current in the current coil by 90 deg. at unity power factor is impressed on the voltage coil, the current and voltage connections may be made to any phase.

Normal Two-element Meters

With the use of a two-element watt-hour meter the required current and voltage relationships may be obtained in various ways. If the connections of a watt-hour meter are modified to correspond with fig. 2, the voltages applied to the voltage coils will be lagging by 90 deg. behind the current in the associated current coils at unity power factor, and the torque exerted on the meter discs will be proportional to 2VI cos $(90-\phi)=2$VI sin ϕ, where ϕ equals the angle of lag corresponding to the power factor. The meter registration must be multiplied by $\sqrt{3}/2$.

While this method is very simple and involves the use of standard apparatus only, it suffers from the disability that under certain conditions of unbalanced load, the results will not be accurate. If one meter element is connected with red current and blue line-to-neutral voltage, and the other with blue current and red line-to-neutral voltage, as in fig. 3, the current and voltage conditions will be as in the accompanying vector diagram, *i.e.*, in one element the voltage will lag behind the current by 60 deg., and in the other by 120 deg. at unity power factor.

The torque produced by one element will therefore vary as VI cos $(60-\phi)$, and by the other as VI cos (120 deg.$-\phi$), the sum of these being proportional to VI sin ϕ. Since phase-to-neutral voltages are impressed upon the potential coils, the voltage across these coils will be $1/\sqrt{3}$ rated voltage, and this factor must be compensated for in order to make the meter direct reading. This may be accomplished by winding the voltage coils for the impressed voltage, by employing a potential transformer of such ratio as to give the correct secondary voltage, or by adjusting the meter gear ratio.

Where the neutral point is not available, an artificial star may be formed with the two meter potential coils and another coil of similar characteristics. If a three-phase potential transformer is not available the required condition may be arrived at by using a star resistance.

Meter with Split-current Coils

The connections of a meter of this type are shown in fig. 4. The instrument is similar to an ordinary two-element watt-hour meter, but with the difference that the current coils are wound in two sections. The two halves of each coil are wound in opposition, so that the resultant is equivalent to the vectorial difference of the current in each section. Thus, in one element the current coil carries the vectorial difference I_R-I_Y, and the potential coil the blue-to-yellow voltage, and in the other the vectorial difference I_B-I_Y, and the potential coil the red-to-yellow voltage.

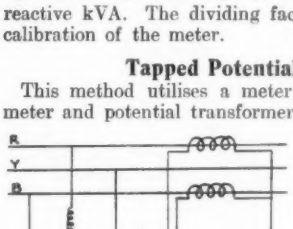
The torque on the meter discs will vary as

$$(I_B-I_Y)\,V_{RY}\cos(60^\circ-\phi)+(I_R-I_Y)V_{BY}\cos(120^\circ-\phi)=$$
$$(I_B-I_Y)\,V_{RY}\cos(60^\circ-\phi)+(I_R-I_Y)V_{BY}\cos(60^\circ+\phi).$$

Under conditions of balanced load I_B-I_Y and I_R-I_Y are equal to $\sqrt{3}$I, if I is the line current, and if V equals the phase voltage, the registration of the instrument becomes equal to $\sqrt{3}$VI$[\cos(60\text{ deg.}-\phi)-\cos(60+\phi)]=3$VI sin ϕ or $\sqrt{3}\times$ reactive kVA. The dividing factor $\sqrt{3}$ is allowed for in the calibration of the meter.

Tapped Potential Transformers

This method utilises a meter identical with a watt-hour meter and potential transformers with centre-point secondary tappings. The connections are as in fig. 5. Each potential coil of the meter is fed by a combination of one line voltage and half another line voltage, *i.e.*, one element has impressed upon it V_1, the vectorial sum of voltages BY and $\frac{1}{2}$ RY, and on the other V_2, the vectorial sum of RY and $\frac{1}{2}$ BY. These voltages lag behind the currents in the associated current coils by 60 deg. and 120 deg. respectively at unity power factor.



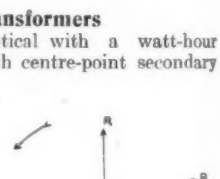
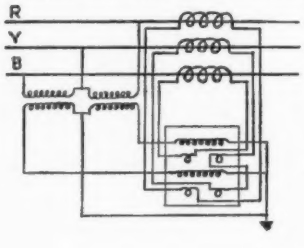


Fig. 3

It should be noted that the voltages impressed upon the potential coils are equal to $\sqrt{3}/2$ times the potential transformer secondary voltage. The meter will therefore register $\sqrt{3}/2$, the reactive kVA if this factor has not been taken into account in the calibration of the meter. An easy method of applying the correction factor is to employ potential transformers of such ratio as to furnish the correct voltage at the meter potential coils. This method is highly accurate, being unaffected by current unbalance and only very slightly by voltage unbalance.

A further method is to obtain the correct angle between the fluxes due to the series and shunt coils, by connecting series resistances in the shunt circuits, and shunting resistances across the series coils, the connections being otherwise as for a watt-hour meter.



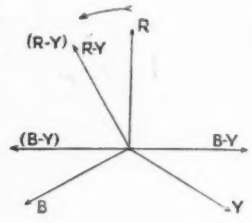
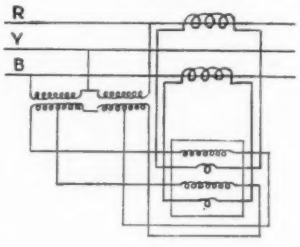


Fig. 4



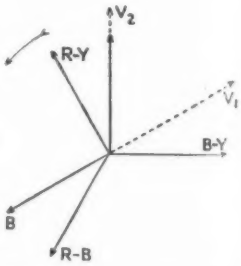
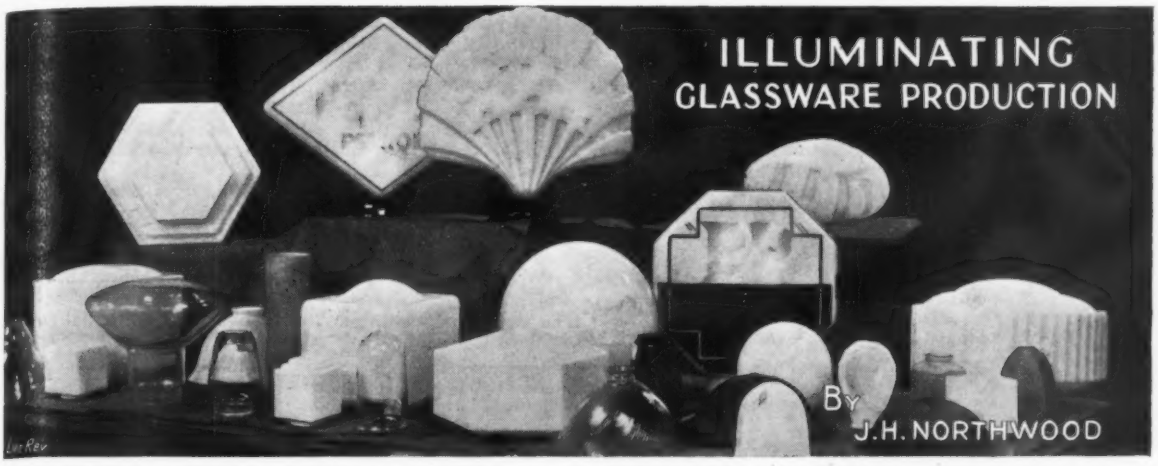


Fig. 5



ILLUMINATING GLASSWARE PRODUCTION

By J.H. NORTHWOOD

BEFORE the War a large proportion of the glassware used in this country for illuminating purposes was imported from Germany and Czechoslovakia, and, consequently, the War resulted in a great shortage. Good came of this, however, because it forced the British glass manufacturers to take up its production, and the resultant developments have been fostered further by protective tariffs.

Modern electric lighting calls for glass units of every conceivable shape and design. Usually, for commercial use, these are made of white opal glass, dense enough to prevent glare and to hide the filament of the electric lamp, but at the same time the opacity of the unit must not be too great, as the less the absorption of light lumens, the greater is the efficiency of the unit. For instance, my company has recently had tested by the National Physical Laboratory two lighting spheres which were made at its works, one in flint glass and the other in three-ply opal glass; the former transmitted 98.95 per cent. of the light lumens of the lamp and the latter 94.75 per cent. This efficiency is remarkably good, especially for the three-ply glass, as although it absorbs so little light it still obscures the source.

To obtain these results the ingredients for the manufacture of glass have to be of the best and purest quality obtainable, the moulds wherein the glass is blown must be of the finest possible engineering craftsmanship in design and finish, and the glassmakers must be very highly skilled.

The chief ingredient of illuminating glass is pure silver sand. To this is added a certain proportion of limespar, soda-ash, borax, &c.; the last gives the glass its heat-resisting quality which is very necessary with the high temperature of the modern gasfilled lamp. Fluorides are used with the previously mentioned materials to give opal glass, and metal oxides are usually added to produce various colours, *e.g.*, by adding a proportion of copper oxide we get a green glass.

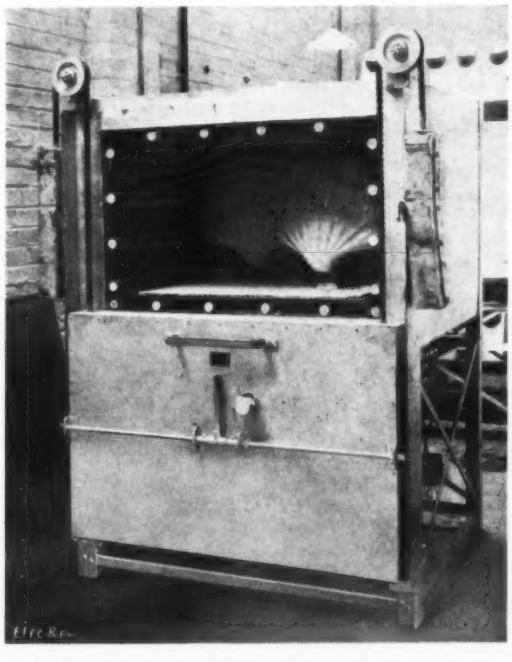
Mixing and Melting

In the "Duroglass" factory of Webb's Crystal Glass Company, our routine is as follows: The sand is thoroughly dried and sifted by an electrically operated sieve and weighed by the man in charge of the mixing department, and the other chemicals are weighed in their correct proportions and added to the sand. All these ingredients are then put into the mixing machine, which is revolved for a certain length of time by a Verity electric motor (totally enclosed to exclude all dust and fumes). The mixing machine is then opened and the contents (now called the "batch") are again sieved into a truck which conveys the batch to the glass melting furnace.

This furnace is built of very highly refractory materials (sillimanite meets the conditions very well) to withstand the very high temperature which is employed in melting the glass. Inside the furnace are large crucibles, or "pots," made of the purest special fireclay; these have to be very good and free from impurities as they are slowly dissolved by the melting glass. The furnace is oil fired by means of Windle low-pressure burners, the air blast being provided by a Keith Blackman combined motor driven fan giving approximately 20 in. of air blast. Three of these fans are installed, each with their own feed lines run from the main distribution board as a safeguard against breakdown. It is very necessary not to have breakdowns during firing as the crucibles in the furnace must never be at less than red heat —they would fracture below 800 deg. C. The furnace is fired continually night and day all the year round until it is necessary to take out the fires for repairs.

The batch is taken to the side of the furnace and filled into pots through a hole in the side of the furnace above each pot, and a fireclay stopper is placed against each hole. Glasses of different colours may be melted at the same time by putting the specially mixed batches in different pots.

After filling, the heat of the furnace is increased to its melting temperature, which is in the region of 1,500 deg. C. Within a few hours the batch becomes fused together and chemical combinations take place, making a very thin liquid of glass full of bubbles, similar to boiling water. The heat of the furnace is then slowly reduced to allow these bubbles to rise out of the liquid glass, and at the same time the glass stiffens as the temperature is lowered until it is ready for working by the glassmaker. The glass is now of a viscous nature, and can be likened to thick treacle. The stoppers are then removed from the holes in the side of the furnace above the pots.



A 16-kW Catterson-Smith furnace for firing on decorations at the Duroglass works

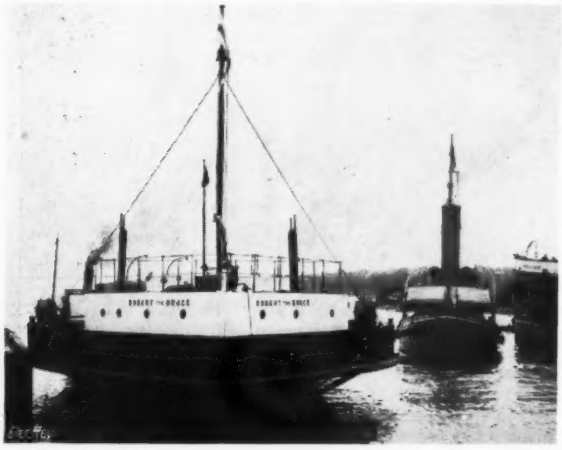
Blowing and Shaping

Briefly, the glassmakers' method of working is as follows: The first operator, called the "ballmaker," takes his blowiron (which consists of a 5 ft. length of hydraulic tubing of the correct strength to withstand the weight of glass necessary for the finished article). This iron is tapered at one end sufficiently for the glassmaker to place between his lips, the other end, the nose, is slightly enlarged and is placed in the hole at the side of the furnace (where the batch was filled some hours previously). When the iron is red hot the ballmaker dips it into the liquid glass, at the same time twisting it; the iron is then slowly withdrawn and a small quantity of solid glass adheres to the nose of the tube; this is called gathering glass.

The ballmaker rolls this glass to a solid ball and then gently blows down the hollow tube; a bubble appears in the centre of the glass and the hollow ball is allowed to cool until it is almost set. He then dips his blowiron (still with the hollow ball of glass on the end) into another pot of glass of a different colour, at the same time twisting his iron and withdrawing it very slowly; this gives another coat or ply on top of the first gathered glass, and these operations are repeated until

the ballmaker has a sufficient number of plies or layers of glass for the article he is to make. It is during these gathers of glass that different layers of colour can be used.

In the previously mentioned three-ply sphere the first ball was of clear flint glass, the next gather of white opal, and the last or outside ply was again clear flint. Each layer is perfectly united to the previous one if the glasses are of the correct composition and worked at the correct temperature. As the ball of glass increases in size the blowing iron, still with the glass on the end, is passed from the ballmaker to the actual glassmaker, who usually gathers on the last ply of glass. The glassmaker then shapes the glass, with hand-operated tools, to approximately the shape and size of the finished article.



The *Robert the Bruce*, a Diesel-electric paddle-boat, which was launched on the Clyde from Messrs. Denny Bros.' shipyard last week. At the same time a sister-ship—the *Queen Margaret*—was launched. The boat illustrated also has the distinction of being of all-welded construction

The size is increased by the maker blowing down the tube, thereby forcing the glass at the end of the tube to expand, at the same time twisting his blowiron quickly so that the red hot glass does not fall away. He then places the glass in the mould, which opens in sections (and has been opened previously by a youth), the mould is closed round the glass and the glassmaker blows down the iron as hard as he can, thereby expanding the glass to the inside of the mould. He keeps in the pressure long enough for the glass to retain its correct shape (this he knows from experience), and when sufficient time has elapsed he releases the internal air pressure.

The Annealing Process

The mould is then opened and the glassmaker withdraws the shaped article still on the end of the blowiron. He then pours cold water on the glass where it joins the blowiron, which, as the glass is still red hot, chills the article at this point. He gives the blowiron a sharp tap with a piece of metal and the article is severed from the blowiron at the chilled portion.

The blown article is then carried on a rod by a youth to a kiln for the annealing process. This kiln is kept at a temperature of 520 deg. C. while it is being filled with the blown articles; this temperature is just below the bending point of the glass. When the annealing kiln is full of glass the doors are shut and the heat slowly reduced until the articles are cool enough to be handled. The annealing process reduces internal strains set up in the article whilst it has been setting in the shape-forming mould. This process is very important, for if the articles are incorrectly annealed they are almost certain to fracture.

On all mould-blown glassware there is a waste portion—the part which joins the article and the nose end of the blow iron. This waste is severed from the required portion by placing the article in an electrically rotated horizontal chuck and heated along the requisite parting line by a very hot flame; this causes the glass to crack round the heated line, and leaves the edge of the article very sharp. Afterwards, this edge has to be trimmed to the correct size to fit the electrical fittings or galleries. This is done by grinding the edge on a horizontal electrically driven mill upon which is run a liquid abrasive paste.

Testing and Decorating

The articles are now taken to the testing department, where they are given a very severe thermal fracture test. This test is carried out by immersing them in cold water (15 deg. C.), withdrawing them and immediately plunging them into boiling water and then again into cold water. If there are any strains left in the glass the article will immediately fracture. Such severe tests are necessary owing to the very dangerous overhead positions in which the illuminating units are usually situated.

Sometimes units are required with a "Superlux" finish, or a satin surface, instead of the usual bright one, which means another process—acid pickling. The acid is contained in lead-lined vats which are heated by lead-coated electric immersion heaters. If the flint glass is required to be frosted it is treated by an electrically driven sandblasting machine. In this machine the glass article is revolved mechanically under a jet of compressed air and sand, and the impact of the sand on the surface of the glass chips it very minutely, giving the glass a frosted finish.

Other processes are decorative painting (done by "Aerograph" stencil work) and hand-painting with ceramic colours. The ceramic paints consist of chemicals which, when heated to 520 deg. C., fuse together, making a vitreous enamel, in reality a very soft glass. When the paint is applied either by spray or hand it has a very dead or flat appearance. The article upon which the design has been placed is put into an electric muffle which gradually heats the article to 520 deg. C. At this temperature the colour fuses on the surface of the glass and becomes glossy. This operation is a very delicate one, as the temperature is very near the softening point of the glass article itself, and for this reason the muffle is thermostatically controlled, cutting off the current at the correct temperature. The colours set as the article cools down, and the design is permanent and impervious to atmospheric conditions.

Some photographs of the processes described are reproduced on page 183.

A Large Kaplan Turbine Set. By R. N. Tweedy

An addition to the Shannon plant

THE speed of large water turbines is governed by varying the opening of the guide vanes. Direct operation by the governor is impracticable because of the great weight of the vanes, so servo-motors are interposed. It is then possible for a governor of the required sensitivity to operate a pilot valve, which utilises oil under pressure to move the main distribution valve, which regulates the flow of high-pressure oil to the servo-motor pistons.

The governor of a Kaplan turbine, besides controlling the guide-vane angle, must control also the angle of the runner blades. This necessarily involves greater complication in design, and particularly the provision of a hollow turbine-rotor shaft to accommodate the main motion rod. The servo-motor for this rod is housed inside the shaft coupling between the generator and the turbine. It consists of the usual oil-controlled piston, the coupling itself being the cylinder. The piston-rod passes down through the hollow turbine shaft and is connected to the movable blades of the Kaplan runner by a toggle system.

High-pressure oil is supplied to either face of the servo-motor according to the action of the pilot valve, one face being fed through a pipe in the shaft-bore and the other through the bore itself. There is also positive connection through the governor actuator rods, between the guide vanes and the runner blades.

Thus the governor operates the pilot valves in the two servo-motors, so moving the gates and the blades simultaneously. The same actuator works both valves, so that there is a definite position of the blades for each position of the gates irrespective of the head of water at the time.

The illustrations on page 193 show the power house at Ardnacrusha, with the new Kaplan turbine driven set in the foreground. Although it has the same normal rating as the other sets, it is considerably smaller on account of the Kaplan design. On the right is shown the rotor of this machine being conducted to its place. The clearances between this rotor and the fixed obstacles in its path were matters almost of the proverbial hair's breadth, and the lifting girders between the twin travelling cranes had to be modified to provide the necessary vertical clearance.

This set is said to be the largest yet made with a Kaplan runner for so low a head as 100 ft.

Optical Train Control. By O. P. van Steewen

An adaptation of the photo-electric principle

IN the development of train control equipments, an objective has been to convey as many different orders as possible to the locomotive and thereby dispense with mechanical transmission agents. Train control effects (*e.g.*, acting on the drop shutters, whistles, optical signal transmitter, etc.) must be given quite independently of each other and, if necessary, must be recognisable in the driver's cab for a considerable period, provided they do not act directly on the brakes. Apart from normal line signalling, consideration is also called for regarding indication of obstructions on the line, compulsory limiting of speed along certain sections such as working places, curves and switches, and indication of the opening or closing of barriers.

Mechanical and, in certain respects also, electrical transmission would involve insurmountable difficulties, inasmuch as there is generally only the space between the rails, up to a few inches above the rail head, available for accommodating the mechanical devices or contacts. In addition, the reliability of such devices would be rather doubtful on account of their sensitiveness to the vagaries of the weather.

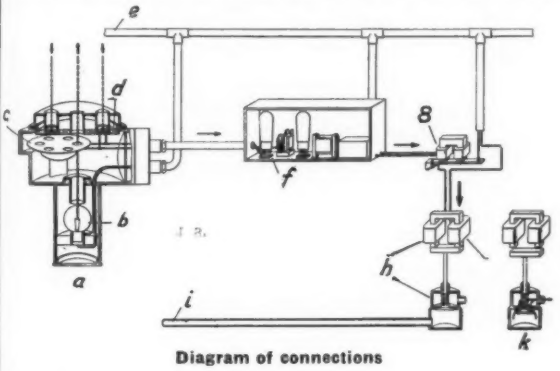


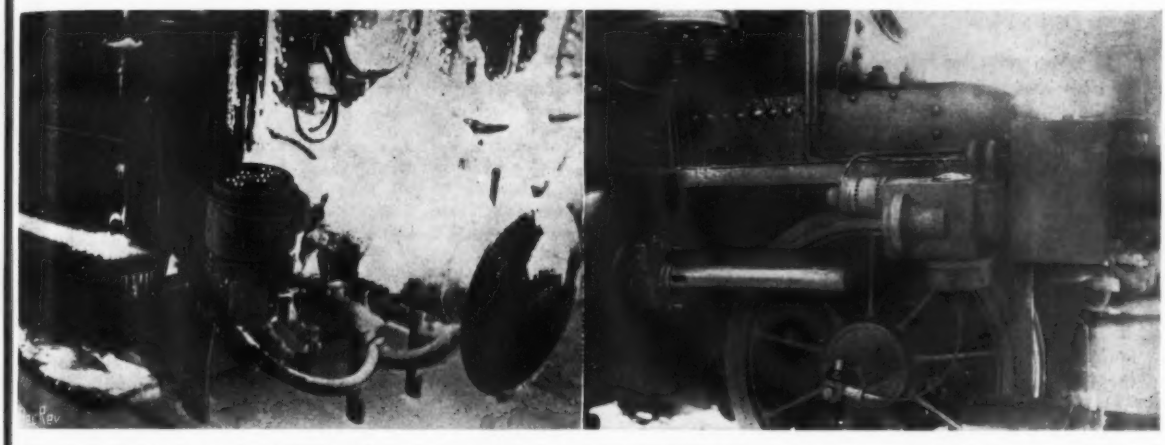
Diagram of connections

a. Searchlight housing; b. searchlight lamp; c. perforated disc; d. selenium cell; e. connection from lighting generator of locomotive; f. amplifier; g. relay; h. braking valve with magnet (closed); i. braking air line; k. braking valve (open).

Employing an invention of Dr. Bäseler, the German State Railways has tackled this problem from an entirely different angle. In the optical train control ("Opsi") it has produced a dependable system, the potentialities of which have been revealed in many experiments under service conditions. The "Opsi" system permits any number of "orders" or direct impulses to be transmitted to the locomotive. It is designed to give positive control along any section of the track under all conditions, and to regulate traffic at crossings with safety.

The lighting generator on the locomotive feeds a projector lamp which is mounted in a headlight unit on the buffer beam of the locomotive and throws an almost vertical cone of light upwards. At all points of the track where control is necessary, *e.g.*, at all advance and main signals, a three-dimensional mirror is arranged at suitable distances ahead of barriers or unguarded crossings, the position of which is dependent upon that of the signal. If the signal is up the mirror is struck by the beam of light from the searchlight unit as the train passes and throws two separate cones of light downwards on to a pair of photo-cells lodged in the searchlight. The appropriate photo-cell is always sighted and struck when the mirror is in a certain position, *e.g.*, the "stop" signal. If another transmission is desired at other positions, the mirror is set to illuminate another pair of photo-cells corresponding to the setting.

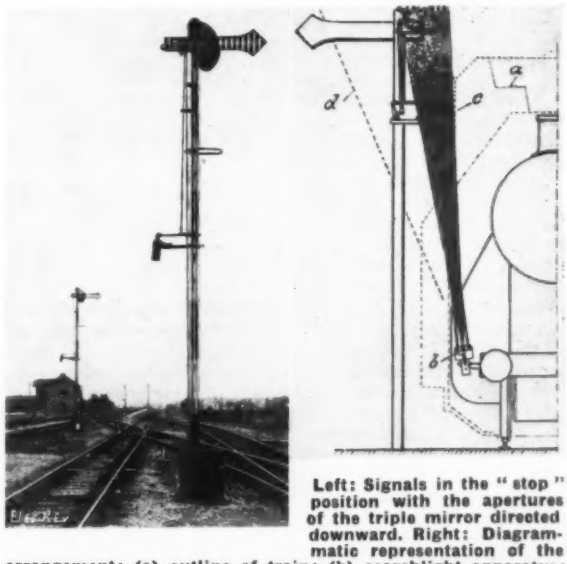
The rest of the equipment is mounted in the driver's cab. There, the weak current originating from the photo-cells passes through amplifying valves which actuate a relay. When in the rest position, the tongue of the relay closes a normally opening circuit *via* the brake magnet. When the light reacts upon a pair of photo-cells through a triple mirror the relay interrupts the circuit; the brake magnets connected with the brake valve open and braking occurs automatically.



Left: An electrically heated searchlight unit on a locomotive and a photo-cell unit with apertures for four pairs. Right: A speed limiter with eddy-current tachometer

Automatic Speed Limitation

Another important field of application is automatic speed limitation. Here, the oscillating system of an eddy-current tachometer is connected with a uniformly oscillating shutter, which shields the photo-cells. The tachometer is accommodated in the searchlight unit and coupled with the front carrying wheels of the locomotive. The shutter can be adjusted accurately to within 2 m.p.h. At an adjusted maximum speed of, say, 50 m.p.h., the shutter would expose a pair of photo-cells at 52 m.p.h., so causing reflection from the mirror and thus compulsory braking. If the maximum speeds permitted vary in different sections of a track the lowest speed adjusted on the shutter would block all the higher speeds. In order to avoid this other pairs of photo-cells are provided for speed-limiting at higher speeds.



Left: Signals in the "stop" position with the apertures of the triple mirror directed downward. Right: Diagrammatic representation of the arrangement: (a) outline of train; (b) searchlight apparatus; (c) three-dimensional mirror; (d) sun at meridian

At the corresponding setting of the triple mirror, within the various speed ranges, the pair of cells for the lower speeds are then no longer struck, although they may have already been liberated by the shutter. In order to prevent exposure to the rays of the sun or other light sources, the searchlight equipment is inclined upwards and casts its beam only intermittently. A little bladed wheel or disc with holes in front of the searchlight, driven by the wind or a small electric motor, intercepts the beam about 500 times per second. Consequently the reflections from the triple mirror must be exactly in synchronism. The amplifying equipment is connected in such a manner that it only reacts to flickering light of this frequency, and any other light which may strike a photo-cell is ineffective.

The triple mirror is complete with silver coating and gives total reflection only of its ground surfaces. A tubular jacket, the air content of which is always steady, prevents fog, dew or soot from contaminating the mirror.

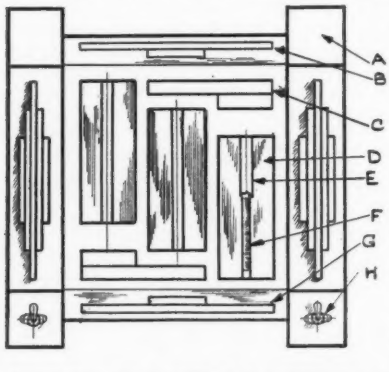
This new system mainly rests on the precise functioning of the photo-cell and amplifying equipment. The salient advantages claimed for the "Opsi" system are: (1) reliability, as proved by tests under all practical conditions; (2) absence of parts situated on the rails or under the locomotive that are difficult or dangerous of access; (3) the transmitting agents need not be equally spaced; (4) precise speed limits are set; (5) it automatically prevents running past signals; (6) no electrical equipment is required on the track; (7) simplicity of transmission of orders to the locomotive to an almost unlimited extent.

Architectural Heating. By A. Curwen

WHEN we speak of "architectural lighting" we refer to built-in and applied luminous features, and by "architectural heating" I mean built-in and applied heating features—and sometimes combined heating and lighting features. The built-in electric fire has obviously come to stay, but while one or two of the larger manufacturers have successfully negotiated contracts with building estates, &c., for the supply of this type of fire, there are still thousands of builders wasting money building chimneys, only because electricity is not yet recognised as providing the most efficient form of heating.

How are we to create this demand for electric heaters? First, we must improve the design until they impress by their very appearance—they must symbolise electricity. This is the age of the unorthodox, and I feel that if fire manufacturers departed somewhat from accepted designs they would find a better market for their products.

Secondly, we must increase the proportion of radiant heat. Convected heat through the medium of flood (panel), ceiling, and tubular heaters is excellent for offices, workshops, and entrance halls, where an unobtrusive effect is wanted, but in the home psychology plays its part—people enjoy sitting around the source of heat. The more we can imitate the radiating effect of the sun, the more nearly will we approach a feeling of bodily comfort in a relatively low temperature.



Suggestion for a portable "architectural" fire

Thirdly, let us sell electricity for heating along definite lines. One of the chief points in selling is to "paint the opposite picture black." I noticed at a recent E.D.A. meeting that speakers, when asked a question on electric heating, immediately started *defending* electricity. I was guilty myself, but surely the best means of defence is to attack. The easiest way to show how healthy electricity is for heating is to show how unhealthy other methods of heating are. Let us talk about smoke, filth, and fog, and then sell, by contrast, the clean, healthy heat of the electric fire.

Borough and town councils, architects and builders, should all be made familiar with the following incomplete summary of the disadvantages of coal as a medium of heating: (1) injury to public health due to the obscuring of the sun and to vitiation of the atmosphere; (2) stunting of vegetation; (3) waste of money and labour in cleaning, renewing, and painting; (4) damage to buildings caused by acid in the air, even iron and steel being as seriously affected as stone; (5) delay in transport due to fogs, including the hindrance and danger to airmen; (6) waste of fuel, which I believe is estimated at something like £6,000,000 per annum, in the form of soot in the air.

It has been stated that 500 tons of soot are dropped annually per square mile at Buckingham Gate, and 1,920 tons at Coatbridge.

The Question of Design

Fourthly, manufacturers might pay a little more attention to detail in the construction of the electric fire and standardise the loading, dimensions, and pattern of the heating elements. Elements of the bar type, *i.e.*, a rod of refractory material on which the resistance wire is tightly wound, so that the whole bar attains the same degree of bright redness as the resistance wire, appear to me to be the most suitable for radiant fires, and their cost would be considerably decreased if they were made in standard sizes.

When manufacturers bring out a new fire they also bring out new elements—new inasmuch as the dimensions are different. The legs or base of the majority of the portable types of fire are usually constructed of straight sheet metal which either scratches the floor or tears the carpet. Further, the screws which hold the fire-clay former of the flat-type element in position are usually not more than about ¼ in. away from the terminals; as these screws are often fitted with asbestos washers large enough to touch the live terminals, the asbestos has only got to get damp to cause a "short." I hope that eventually portable electric fires will be so constructed that the centre of gravity is *really* low, thus minimising the risk of overturning and reducing element renewals which are now far too frequently necessary.

I hope the above can be called constructive criticism, and I offer the following further suggestions to fire designers and manufacturers. If they are not practicable or are likely to prove difficult to work out, I hope I may be excused, as I am writing as a member of the public, and not as a fire designer.

The accompanying figure is a rough sketch of a portable fire, which is given to illustrate the principle of floodlighting a facia, and not as a specimen design. The heating elements are of the rod type set behind a protecting strip, in a chromium-plated recess. The setting out of the elements is simple, but a little unorthodox. The switches are on the front; there are no projections on the side to prevent the fire being placed in a close-fitting recess or fireplace. The facia of the fire has ornamental projections designed to cast effective shadows when floodlighted by means of a tubular lamp hidden in a recess on the front of the fire beneath the elements. In the sketch, A, B, and C indicate suitable types of projections, D the chromium-plated recesses, E the protecting strip, F the rod-type element, G a hidden recess for the tubular lamp, and H the switches.

Learning from Lighting

A visit to the Elma Lighting Service Bureau should prove a source of inspiration to fire designers, for the effects that can be achieved by merely floodlighting suitably designed projections, constructed to cast effective shadows, are truly remarkable. I daresay the day will come when we shall have ornamental neon facings to our built-in fires.

With the built-in fire we can be more ambitious, for we have more room on which to work. I would suggest as a suitable place for a built-in fire an opening similar to a setting for architectural lighting. A chromium-plated reflector recess set in the wall would be the background, with a sheet metal design as the facia, after the manner of a fountain setting, or an organ-pipe design, behind which, in a trough reflector, would be the rod-type elements. The heat would thus be reflected from the trough on to the focus line of the chromium-plated reflector, which could be designed on a parabolic principle. The general appearance would then be a silhouette against the red glow of heat emanating from the opening around the silhouette. Again one could have the reflector built in, with the rod-type elements in troughs on either side of the opening—hidden from the eye. The general impression would then be that of a bowl of glowing heat. More elaborate types could be designed with the facia or recess floodlighted, with the heating elements set on the facia or silhouette section of the heater. Surrounds could, of course, vary from the "setting sun" effect to the ornamental arch.

I hope that, as this is the time of the year when fire manufacturers start thinking about next season's fires, they will allow their thoughts to dwell on suitable designs and that they will take heed of Lord Avebury's warning, "It is better to sleep over what you are going to do than be kept awake by what you have done."

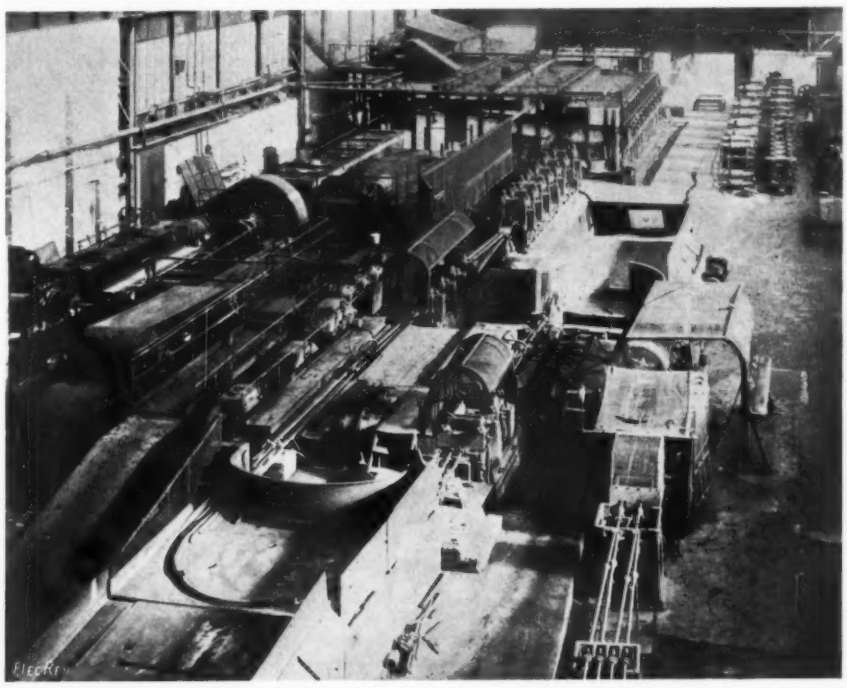
Overhead Line Conductors

Producing wire rod from the billet

BY the courtesy of British Ropes, Ltd., we were recently afforded the opportunity of seeing the production of overhead line conductors from the crude metal in billet form to the finished product, through the three main stages, namely, hot rolling the billet down to the wire rod, the raw material for the wire-drawing processes; actual wire drawing; and the formation of the completed conductor.

The first of these processes we saw carried out at the works of Templeborough Rolling Mills, Ltd., an associated company, at Rotherham, one of the most modern continuous hot rolling mills in existence. In this mill, which is a post-war plant, the original motive power was provided by steam engines, but it has since been converted to electric driving, the change-over not only keeping the mill up to date and efficient, but also increasing its productive capacity.

Billets approximately 2 in. square by 30 ft. long are charged singly by power-driven rolls, after inspection, into the top and cold end of a continuous reheating furnace in which they remain for about an hour before being introduced to the mill proper. This reheating furnace is designed on the sloping-bed principle, the billets lying parallel across the slope. The billets are gradually pushed down the slope to the lower or hot end by a system of bell crank levers aligned along the length of the top end of the sloping bed so as to operate on the full length of the billets. The effect of a single movement of these bell-crank levers is to push the billets about one foot down the slope, and on the withdrawal of the levers the empty foot of space is replenished by new billets.



A general view of the Templeborough rolling mill, looking towards the furnace

In the furnace the temperature of the billets is raised to about 1,150 deg. C., a suitable point for hot rolling. At the bottom of the furnace a power-driven bar is applied to the end of the lowest individual billet, pushing it longitudinally across the bed and out through a small door on the far side of the furnace. A short distance from the door the billet enters the mill proper, its first contact being a switchplate which enables the operator to send any individual billet into either pass of the first pair of rolls.

The Rolling Mill

The mill itself is a double-stranding Morgan continuous mill with seventeen pairs of rolls through each pair of which the billet passes, the reduced section then being led to a reeling machine on which the wire rod is coiled into a suitable size for the wire drawer's swifts. In 99 per cent. of cases when there are stoppages of one of the strands the other strand is kept going, a highly creditable achievement of the operating crew. The mill has an S-shaped layout, so as to save space, the bends of the S being surmounted without manual labour by repeaters, *i.e.*, semi-circular grooves round which the reduced metal is propelled by the pair of rolls immediately preceding the repeater.

For driving purposes the mill is arranged in two sections, the first portion containing the roughing mill (seven pairs of rolls), and the intermediate mill (four pairs of rolls). This represents a straight line of machinery preceding the first repeater, and is driven through gearing by a 2,400-h.p., 500-V d.c. variable-speed motor. The second half of the mill, containing the finishing rolls, is also arranged in two portions, the first containing two pairs of rolls which receive from the first repeater and deliver to the second, and the second portion containing four pairs of rolls which receive from the second repeater and deliver to the reeling machinery. This portion of the plant is driven through a very large (4 ft. 6 in. wide) belt and gearing by a 1,400-h.p., 500-V d.c. variable-speed motor.

The reduction of section from the billet to wire rod is effected by the rolls through alternating changes in pass design from oval to square to oval, &c., finishing by oval to round, and when it is appreciated that the reduction in cross section is from 2 in. square to, say, 0.212-in. diameter (5 s.w.g.) it will be realised at what widely varying speeds the hot metal has to travel through individual pairs of rolls, the last pair of finishing rolls having to cater for the tremendously elongated billet. The weight of a billet is approximately 3 cwt., and it leaves the rolling mill just under 3,000 ft. long. Each billet is only one minute in the mill, and it enters the reeling machinery at approximately 35 miles per hour. The reeled bundles are about 30 in. in diameter.

From the reeling equipment, at which the rod is still at approximately 900 deg. C., the bundles or coils are transported by a power-driven conveyor from the mill through the store, undergoing gradual cooling, inspection, tieing up securely coil by coil, labelling, and so forth, and, finally, up to the despatch transport.

High Productive Capacity

With the aid of the electric drive and an efficient crew, the productive capacity of the mill can comfortably exceed 100,000 tons a year of finished wire rod. In considering this figure and the high speed of conversion, it is a common fallacy for the uninitiated to imagine that such processes must be to the detriment of the quality of the product, whereas, of course, in actual fact it is a very distinct advantage to the metal quality, as well as to the rod section, for with the high finishing temperature the steel finishes above its normalising temperature, *i.e.*, there is no strain from *cold* working sometimes resulting at the finishing rolls of slower mills; and again, due to the speed and small drop in temperature between the first end out and the back end out, the variation of section is negligible.

The next process is the wire drawing, and as this is essentially a cold working, *i.e.*, strain-increasing process, the resulting strain depending upon the proportion of reduction effected in the process, it will be appreciated what the value is of an even-sectioned rod from end to end, to a wire drawer attempting to obtain a particular set of tests, *i.e.*, even strain throughout the whole of the wire to be produced.

Woodpeckers and Pole-lines

A new light is shed on the question of the damage done by woodpeckers to poles supporting overhead lines in a letter written to a daily paper by the secretary to the Royal Society for the Protection of Birds. He states that 75 per cent. of the woodpecker's food is formed of the most injurious wood-boring beetles and their larvæ, and that with the exception of the tits and gold crests, there is probably no bird so generally beneficial to the well-being of trees. Attacks on timber in which noxious insects are present is regarded as a useful danger signal.

Glass-house Heating. By S. F. Osborne

ALL who are responsible for load building in rural areas will agree with the opinion expressed in a recent REVIEW leader that "no attempt should be made to obstruct the plans for an extended E.D.A. on the grounds that it is no use boosting the use of electricity unless supplies are first available everywhere." The cream of the load is still untouched in many rural areas where abundant supply is available.

The following figures give some indication of the size of the load which should be obtained within the next few years in the horticultural areas. There are approximately 7,000 acres of nurseries in this country for which the expenditure on coal is in the region of £300 per acre per year. This means that about £2,100,000 is spent annually on fuel alone. The day when this heat will be supplied electrically is still far away, as a large proportion of these nurseries have been erected within the past few years and are consequently fitted with modern heating apparatus. However, quite 20 per cent. are fitted with old heating apparatus, and if only 25 per cent. of this and 25 per cent. of the new installations erected next year were replaced by electric heaters the load obtained would be at least 75,000 kW and the annual consumption about 65 million kWh.

[Jerome, Ltd.

Mr. S. F. Osborne is engaged in electric soil-heating and electro-culture research

In an address on oil fuel given by Mr. N. L. Hudson to the members of the Worthing branch of the National Fruit Growers' Union it was said that oil suppliers were doing much to promote the use of oil instead of coal for heating in nurseries, but that electricity supply undertakings appeared to be doing nothing in this particular direction, although in many areas they could give a supply at a competitive price.

Though the load factor of any tubular heating installation considered singly is low compared with the domestic load, the diversity among a number of installations is such that the resulting load factor is equalled by very few domestic or industrial loads. The loading of a space-heating and soil-heating installation in the same glass house can be so balanced that each can be used alternately. The soil-heating installation can be switched on for a much shorter period than can the space-heating installation, as rapid changes in temperature are more marked in air than in soil; the installation can be controlled by thermostatically operated change-over contactors.

Excessive temperature drop in either installation can be avoided by thermostats with a close differential—about 10 deg.—enabling each circuit to be closed at more frequent intervals than might otherwise be possible. The complete installation could be fitted with a change-over switch to give short-period supplies to auxiliary apparatus such as water pumps and spray plants. The falling-off of the heating load during the summer months can be compensated for by such apparatus as graders and feed-water pumps, which are used more extensively in the summer than winter, giving a good overall load factor.

An alternative method of connecting the installation is to fit two-way contacts on the thermostat controlling the space-heating installation, the second set of contacts being connected in series with the thermostat of the soil-heating installation and thus only giving supply to the soil-heating installation when the space-heating circuit is open.

Costs and Revenue

The high first cost of an electrical installation, which so often retards development, is not so marked in the horticultural load as in many domestic loads. For example, an electric cooker suitable for three or four persons, together with its installation, costs about £12. At one kWh per person per day the annual consumption for four people would be about 1,500 kWh, thus giving a return of 125 kWh per annum per £1 of capital expenditure. The result obtained from an electrically heated glass house 32 by 100 ft. was 15,880 kWh in one year. The cost of the installation being £55, the return was 289 kWh per annum per £1 of capital. The price per kWh obtained for a supply to the glass house was less than that obtained for cooking in the same area (0.75d. for cooking and 0.45d. for heating), the resulting revenue therefore being 8s. as compared with 10s. 10d. per annum per £1 of capital.

A letter from a horticulturist near Worthing appeared a few weeks ago in the correspondence columns of a horticultural journal stating that he was paying 1s. 9d. per 1,000 gal. of water from the local authority for his nursery. Conditions for private wells are ideal in that district, and electricity is obtainable at ¾d. per kWh. The cost of pumping 1,000 gal. electrically would be about ¾d., which leaves 1s. 8d. per 1,000 gal. to pay for depreciation and interest charges on the pumping plant—many times the amount required. There are about 2,300 acres of glass houses in the Lea Valley and Worthing districts. About 3,000,000 gal. of water is used annually per acre. If this were pumped electrically from private wells the consumption would be about 3,500,000 kWh.

Automatic Combustion Control

IT is now about three years since Kirkstall power station of Leeds Corporation was started up. In the technical description which we published in our issue of March 27th, 1931, we gave an account of the "Bailey" automatic boiler-control system. The position of this station at the head of Group C (with outputs of from 50 to 100 million kWh), and as third of all the stations included in the Electricity Commissioners' returns for 1933, indicates that the automatic principle is sound.

The following year the "Kent" system was introduced at Hackney for the 30,000-kW extension, and was described by us on May 27th and June 3rd, 1932, when we referred to the proposal of Mr. L. L. Robinson, the borough electrical engineer, to run the boilers sometimes on hand push-button control to obtain comparative results. A two weeks' test, one week on each system, entailing 23,000 half-hourly readings, showed that only 78.1 per cent. was achieved by manual control, as against 84 per cent. when working automatically, the saving being about £10,000 per annum for the three boilers. In addition, a yearly saving of £200 is made, due to a reduction of power for the fans by 25 per cent. on account of the greater vigilance of the automatic features. The CO_2 content was normally 2 per cent. lower with push-button control.

The paper which Mr. Robinson read in conjunction with Mr. J. L. Hodgson before the Institution of Mechanical Engineers on "The Development of Automatic Combustion Control" justified his decision to adopt the system at Hackney. The authors showed that the physical quantities on which combustion control is based are: boiler pressure, fall of receiver pressure and its rate of change, damper positions, fan speeds, furnace pressure, steam flow and temperature, air flow, CO_2 and CO, stoker or fuel feeder speeds, primary air speed and rate of water feed.

Furnace-pressure control eliminates the effect of fuel-bed resistance on combustion rate; for pulverised fuel the control is by feeder speed and primary air. There are two main types of control: those which merely adjust air flow and water feed to meet demand, and those which also proportion fuel and air feeds to obtain the highest permissible CO_2 value at each load.

Only two control systems keep the receiver pressure constant; the others base the operation of the control mechanism on its fall. The avoidance of "hunting" entails quick and finely graded response to the controls; with d.c. motors the studs on the shunt rheostat should be numerous, or the dampers should be readjusted between each stud position, or thyratron tubes may be used to control the damper position. With twin fans, one fan only should be controlled, the other following it; forward bladed and radial bladed fans cannot be run in parallel, owing to the flatness of their pressure delivery curve over the range of maximum efficiency.

When more than one fan is used, an automatic safety device should be provided at each fan outlet to close a damper in the case of failure to prevent air blowing back through the stationary fan. The jerky motion of air-operated pistons and the uncertain speed control of present hydraulic couplings make them unsuitable for rapid control.

The value of automatic control is to prevent smoke, to maintain load against demand, to carry out routine adjustments, to facilitate group control of boilers, and to increase thermal efficiency by continuous adjustments within small limits. In many cases also the provision of limit switches and other protective devices with automatic control facilitates the safe handling of the plant. Flexibility of adjustment, ability to maintain any desired condition or relation, and ease in changing over from push-button or to hand control are among the most important desiderata.

Automatic and interlocking safeguards should be of quite as much value on the steam as on the electrical side.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Summation Metering on the Grid

THE reasons why impulse instead of electrical summation was chosen for large equipments on the grid are explained in the paper by Mr. J. Henderson, which was read before the Meter and Instrument Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London, on February 2nd.

Mr. J. Henderson is a member of the Central Electricity Board's staff in Scotland

For duplicate circuits electrical summation has been adopted as being simpler and less expensive. The types of meters installed were specially designed for grid metering purposes, and the accuracy obtained is an advance on previous requirements.

The methods of impulse transmission and reception are described and compared, and it is shown that for uniform accuracy and performance "graded" impulsing is essential. The rate of impulsing has a decided effect on the life of the equipment and also on its accuracy. Considerable experience has already been gained in several of the grid districts, and the modifications which have been made to weak designs have resulted in consistent and accurate records.

Only one manufacturer has adopted graded impulsing for the grid metering equipment, although in each individual installation the number of units transmitted per impulse is properly proportioned to the largest circuit in the installation. It is probable that, in the future, graded impulsing will be demanded on individual circuits as well as on each installation.

Mechanical summating equipment on multiple circuits is external to the kWh meters, which have no additional work imposed on them other than that due to the initiation of each impulse. The summation is carried out by one mechanism, each element of which acts as a receiver of impulses from its associated kWh meter. The summator therefore comprises a number of receiving elements connected mechanically or electrically to the maximum-demand indicator and its printing or recording device. The idea of impulsing electrically throughout appears to be sound in principle and reflects great credit on its designer.

The large financial transactions dependent on the metering records make exacting demands on the equipments, and the number of operations performed annually necessitates constant and regular maintenance, for which a suitable programme is suggested. The number of faults to be expected on a satisfactory equipment is indicated, and it is shown that, although the majority of these are of a minor nature, delay in drawing up fault reports may result in the records being lost at a critical period.

By testing against a portable sub-standard it has been possible to avoid removing meters from site for re-calibration.

Research in the British Post Office

THE paper in which Mr. B. S. Cohen describes the Post Office research station at Dollis Hill, which was referred to last week, was discussed at the INSTITUTION OF ELECTRICAL ENGINEERS in London on February 1st. A scale model of the buildings was exhibited, together with samples of instruments and apparatus which have been developed by the staff. Two short cinematograph films illustrated the location, by a new method, and repair of submarine cable faults at sea; and also the effects of lightning on overhead pole lines as indicated by high-voltage impulse generator discharge experiments.

Mr. C. C. Paterson discussed laboratory organisation. He did not think the Dollis Hill establishment could be described as at all lavish, considering the very large organisation which it had to serve and the important results that it produced, but it had been designed by men who knew what they wanted. At Wembley he found it better to provide a small workshop for each laboratory rather than a central common one for all, and he was about to install loud speakers instead of signal lamps for staff location. The stores organisation was the same in both cases, which showed that research workers came to the same conclusions when untrammelled by professional administrators.

By omitting to mention work done by manufacturers the paper might convey the impression that no telecommunication research had been, or was being, done in this country outside the Post Office.

Hastening Obsolescence

Lieut.-Col. A. G. Lee, engineer-in-chief, G.P.O., asked whether there was any means of determining the optimum amount of money that should be spent on research. There must be some limit. One was usually advised to spend as much as one could afford, but too much research might produce an abnormally high rate of obsolescence of existing equipment. The P.O. desired to co-operate fully and to share knowledge with outside organisations.

Dr. P. Dunsheath referred to the pioneer research work of the P.O., for example, in cable sheath investigations, and its very great assistance to the R.E. Signals during the war. Ordinary life tests applied to telephones might be misleading, since the instruments received much more severe handling in everyday use. Some investigations took years to complete; instead of waiting for a final report it would be better to record such information as was obtainable in periodical reports, say monthly. The United States derived much benefit from the work of an official lecturer who went about the country telling the public what the research department was doing.

Mr. R. M. Chamney paid a tribute to the work of his colleague, the late Mr. C. Robinson, in connection with repeater and valve investigations. He could not agree that early valve research had been done outside the P.O., which was indebted to its staff for the fact that it was to-day free from repeater patent trammels. The P.O. had itself exhausted all the valves used for the first commercial repeater station opened in Europe.

Research—Academical and Practical

Mr. E. S. Byng remarked that the prestige resulting from the possession of a research department was important, even if a definite financial gain was not apparent. The small proportion of the Post Office's total expenditure which was allocated to research showed that the taxpayers' money was not being wasted. Research in any progressive industry most certainly paid for itself, but the risk must not be overlooked of becoming academic and carrying pure research too far without regard to the commercial aspects. The products of research should not be adopted too quickly without allowing a time lag for the manufacturer to adjust himself to the change.

Mr. B. S. Cohen, in reply, stated that besides final reports, interim statements were furnished, which enabled the progress of, and amount of money spent on, each item to be checked fortnightly. He considered the P.O. was liberal with its publications, and was anxious to publish everything that was worth publishing as soon as it could.

Velocity Modulation for Television

THE practical development of a complete television system operating on a velocity modulation basis is described in the paper by Messrs. L. H. Bedford and O. S. Puckle, which was read before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London, on February 7th. The theory and advantages of the method are discussed, and its limitations are shown to be overcome by the application of the principle of intensification.

The basic idea is to obtain light-intensity variations in the received picture by varying, not the instantaneous intensity of the scanning spot, but its instantaneous scanning velocity, *i.e.*, its speed of traverse over the screen, the actual light intensity of the scanning spot remaining constant. If a light-spot of constant intensity describes a repeating oscillogram, in which the instantaneous traversing speed varies from point to point, the eye will appreciate this state of affairs as such only if the movement is sufficiently slow. If the movement is so rapid that the oscillogram is completed in a period within the persistence of vision the eye receives a totally different impression, namely, that of a stationary oscillogram with variations of brightness along its length. The brightness which the eye associates with an element of the oscillogram is that obtained by averaging over a period of time the instantaneous flashes of light which occur as the spot passes through the element. Thus, if the actual intensity of the light-spot is constant, the apparent brightness of the element is propor-

tional simply to the time taken by the spot to traverse the element; hence the apparent brightness is inversely proportional to the local instantaneous scanning velocity.

This principle presents the possibility of obtaining light and dark in a received picture without actual modulation of the spot or ray intensity, and it is therefore specially suited to television reception by means of the conventional cathode-ray oscillograph, which is practically the only instrument which has sufficient freedom from inertia to reproduce successfully the extremely abrupt changes of velocity called for.

Cathode-ray Transmission

The scanning element at the transmitter must also be a cathode ray, but direct subject transmission is not considered to be outside the bounds of possibility. The present paper is, however, exclusively concerned with making the spot of a low-voltage oscillograph illuminate a cinema film point by point (through a lens), the light transmitted through the film falling on to a photo-cell, and causing the output from the photo-cell to react back on the scanning oscillograph in such a manner as to control the instantaneous scanning speed.

The photo-cell output must determine only the instantaneous speed of the scanning spot, not its position or intensity. A copy of the picture appears on the screen of the transmitting tube itself solely by means of the voltages applied to the deflector plates of the oscillograph. The same picture will therefore result on any similar oscillograph to which these voltages are faithfully transmitted, so that the question of synchronisation does not arise. This feature is one of the most important advantages offered by the principle.

Von Ardenne has attempted to transmit these two line and picture deflector voltages, over a single physical channel, by frequency discrimination between them. The solution adopted by the authors differs fundamentally and depends on converting the intelligence to a single channel by sacrificing implicit synchronism in the picture-traversing direction, whilst retaining it in the line-scanning direction.

The principle offers two advantages: (*a*) absence of the synchronising problem, at least in the line-scanning direction; (*b*) absence of intensity modulation of the cathode ray. In addition there are two other features to be noted in comparison with the intensity-modulation principle: (*c*) increased picture brightness for a given receiving oscillograph; (*d*) concentration of detail in the light portions of the picture, since scanning is relatively slow in the lighter portions of the picture so long as the contrast ratio of the picture is kept low; but as soon as a high contrast ratio is attempted the sacrifice of detail in the dark places becomes objectionable.

The authors therefore transmit a velocity-modulated picture at low contrast level, and superpose intensity modulation upon it at the receiving end. This is a remarkably advantageous combination of the two principles, since both kinds of modulation work at their best only when called upon to operate over a relatively restricted range.

[*Elliott & Fry*

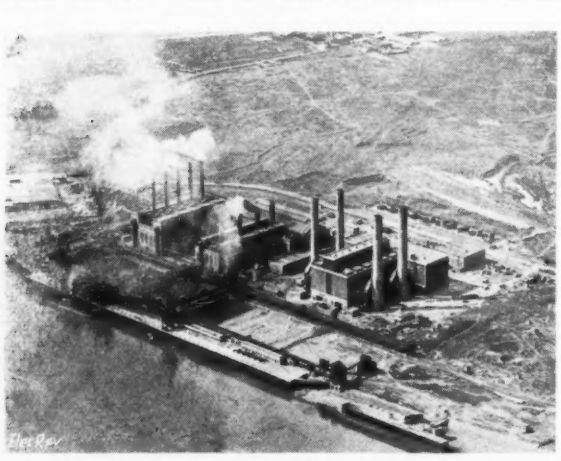
Messrs. L. H. Bedford and O. S. Puckle are members of the staff of Messrs. A. C. Cossor, Ltd.

The Design of Surface Condensers

THE growth in the size of steam condensers, accompanied by the development of more accurate methods of testing them, has disclosed many cases of disappointing results. The apparent rate of heat transmission as deduced sometimes appears to be alarmingly less than had been obtained with smaller condensers. In large plant the actual vacuum has proved to be from 0.25 to 0.75 in. less than could be reasonably expected. Since between 28 and 29 in. of vacuum 0.5 in. corresponds to a difference of nearly 3 per cent. in steam consumption, the financial loss in the case of important plant is considerable. In many instances it has been found that the vacuum in a particular condenser could be materially improved by removing from 20 to 30 per cent. of the tubes.

This phenomenon has not resulted in a correspondingly large increase in steam consumption in this country, partly because the absolute change in dimensions is not so great here as elsewhere and partly because the allowance for air extraction is more generous than abroad.

In a paper by Messrs. H. L. Guy and E. V. Winstanley, which was read before the North-Western Branch of the Institution of Mechanical Engineers at Manchester on February 1st, it is suggested that the poor performance of certain large surface condensers is due to pressure drop on the steam side. Test results show the pressure drop for various patterns of tube plates and illustrate the steps taken to reduce it. The effect of pressure drop upon the mean temperature difference is discussed. The limitations of accepted formulæ are criticised and the results of more accurate analysis are presented.



This aerial photograph of the Barking power station shows the new "B" section which was described last week

A mean value is suggested for the rate of heat transmission from steam to tube, while a method of obtaining the net heat rejected to the circulating water in power plant is developed and the departure from the conventional figure of 1,000 B.th.u. per lb. is brought out.

The paper also deals with the effect of tube fouling upon the overall rate of heat transmission, and methods of obtaining a margin in surface to allow for this are discussed. The effect of pressure drop upon the duty of an air extraction plant and certain problems arising therewith are discussed. Some actual air leakage tests are given and compared with recognised standard allowances. The authors deal with the friction on the water side with various methods of tube plate fastenings. Recommended standard values of the various factors for assessing condenser water friction are given, together with tests from commercial installations.

The paper concludes with a treatment of the problem of syphonic return in condenser circulating water systems and gives a method of calculating the syphonic efficiency.

* * *

Characteristics of Electric Discharge Lamps

Some characteristics of electric discharge lamps were described and demonstrated in a lecture given in Manchester on January 30th by Mr. H. R. Ruff, of the Research Department of the British Thomson-Houston Co., Ltd., before the North-West Area Section of the Illuminating Engineering Society.

Mr. Ruff showed that with the sodium-vapour lamp highly coloured wallpapers appeared as black, white and grey. A lamp using mercury vapour contained strong yellow, green and blue elements, and in its light coloured papers showed up quite well, greens and blues being conspicuous, although red assumed a rusty brown hue. That there was, however, an appreciable amount of red in the light of these lamps was shown by placing a sheet of ruby glass in front of one of them, which provided 16,000 lumens for 400 W. These lamps were suitable for use in factories as well as for street lighting, as the unusual colour of the light was not generally a disadvantage, but care was necessary when applying them to processes with revolving machinery, owing to stroboscopic effects, by which wheels appeared to be turning in a contrary direction.

A new form of vacuum lamp containing mercury, which emitted a moderate amount of ultra-violet light and was thus useful from the hygienic standpoint, was also shown.

Another meeting of the Society is to be held in Manchester on March 15th, when there is to be a display of exhibits showing progress in illumination.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Electric Irons—A User's Experience

Further to the correspondence regarding electric irons which has appeared recently in your correspondence columns, our own experiences may be found interesting.

We use about thirty-five irons, by a well-known maker, running them off 230 V a.c. from our own plant. They weigh 5¼ lb., are loaded at 575 W, and are listed as "domestic" irons. Our only troubles, apart from flexible cords, have been two element burnouts, due to irons being left switched on accidentally for several hours. These have been replaced by the makers under guarantee. The irons have mostly been in use for two years, working regularly eight or nine hours a day, and the wooden handles and thumb rests are already showing signs of wear from the friction of the workers' hands. They have probably received the equivalent of at least five years' ordinary domestic use.

The connectors have given no trouble; the earthing arrangement is simple—a spring metal tongue on the back of the handle presses on the metal body of the connector, to which the spring outlet for the flexible is securely fastened. We find that a new cord will last for about eight weeks, after which it frays at the connector and has to be shortened. By starting with a cord about a foot longer than standard its effective life becomes about six months, after which it is too short to be used. Three-core flex is exclusively used, the irons being earthed through three-pin interlocking switch plugs and sockets.

Many types of flexible cord have been tried, and we have definitely found that the kind which contains additional cord strengtheners has *not* given such good results as the plain cord, *i.e.*, three conductors with moulded circular tough rubber, cotton braided. The cord strengtheners in the other type, whilst they certainly relieve the cord of any accidental pull, appear to localise the twisting stresses which are always present, and cause the cord to break close off at the connector.

I trust your correspondents will find these practical notes of some use.

A. GREENWOOD,
Manager,
Norwood & Dulwich Dyeing, Cleaning & Carpet Beating Co., Ltd.

London, S.E.27, *February 5th.*

Comfort at the B.I.F.

In previous years exhibitors' stands have often been deserted and attendances poor through lack of warmth at both the Castle Bromwich and Olympia sections of the British Industries Fair, and comments such as "The exhibits were excellent but the place was like a barn" have been heard.

Comfort in the form of heat, light and ventilation, with a measure of freedom or protection from tobacco smoke, are essential factors to success. Friendships and business relationships can be quite easily developed in comfortable surroundings, but no one can sell and much less buy in an atmosphere equivalent to that of a barn, hence many "enforced" absences *and expenses* in warmer saloons, buffets and restaurants, and, in many cases, a consequent loss of further business to manufacturers, who have to foot the bill in all directions.

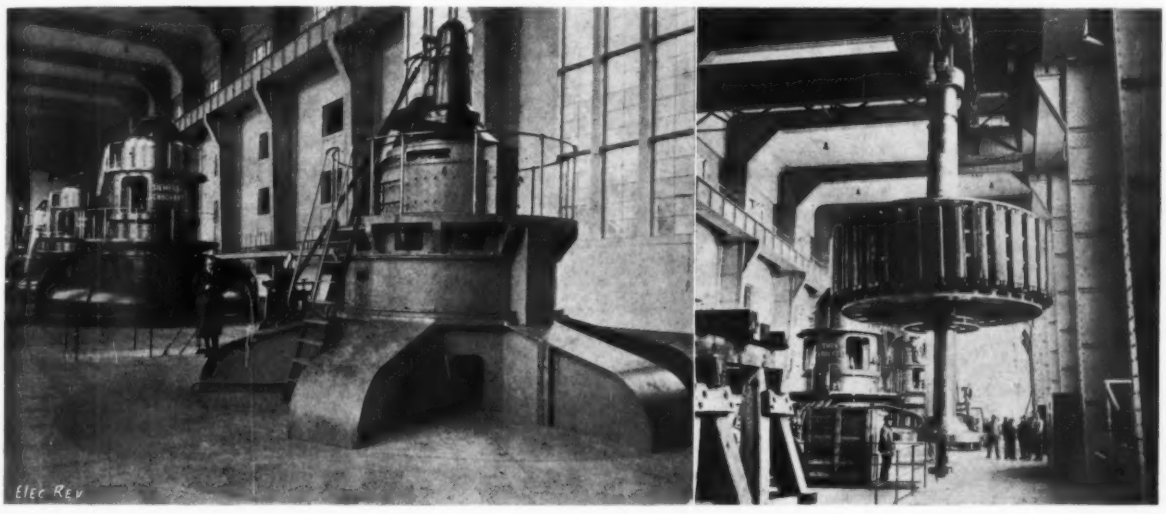
Exhibitors have been let down badly by the promoters in the matter of heating, and a strong united demand for an efficient heating system of modern (*i.e.*, electrical) design, British, too, is of urgent importance and highly necessary for the ordinary comfort of visitors, exhibitors, and staff in all parts of the buildings.

Sufficient reserve in the system would be required to cover sudden cold spells and damp and foggy days, and ample protection at all entrances, exits and windows, a point often overlooked, is still more important to prevent the entry of cold.

Co-operation between the promoters and the local supply undertakings could be easily arranged, using off-peak load at advantageous rates for storage-heating, a tabulation of costs and daily outside temperatures being preserved which could be used to announce and boom the electrical heating idea for large buildings—*now*!

CYRUS HAYES.

East Croydon, *February 5th.*



The Ardnacrusha (Shannon) power house showing the large Kaplan set mentioned on page 186. Right: The runner being placed in position

Poor Speech at Technical Meetings

The article with this title on page 128 of your issue of January 26th voices the feelings of many who, although thirsty for knowledge, would prefer the drink to be palatable and, if possible, stimulating. But when "Auribus" states that it is the simplest thing in the world to commit a résumé of a paper to memory, then I entirely disagree with him. To condense a lengthy paper into half-an-hour's discourse, keeping the balance of the subject and holding the interest of the audience, is an exceedingly difficult task. All praise to those who do it well.

The I.E.E. Informal Meetings, held on alternate Mondays, are excellent training for the lecturer and those listeners who contribute five minutes to the discussion. The informality is very helpful, and an offender is usually "told off," but the weak are always encouraged. The chairman is the person who can cure most of the complaints made by "Auribus." Let the chairman exercise his office more firmly and improvement will follow.

M.I.E.E.

January 29th.

"Auribus" touches upon a subject which has been one of wonderment to me for years. Why need the meetings of the great engineering institutions be so dull and monotonous? Why need scientific papers, quite interesting in material, be turned into soporifics or irritants by being droned out by author or secretary in a manner which would make a B.B.C. announcer sound quite skittish? Why do so many engineers seem to think it beneath them to cultivate the art of public speaking so that they may convey their views and ideas to others in an agreeable and intelligent manner? Surely it is an accomplishment of which no man need be ashamed and is a duty which he owes to his fellows.

Some of the propaganda lectures organised by various interested associations cannot carry any conviction to lay audiences. The lecturers appear to be saying their little

piece, only interrupting themselves and their monotonous delivery to switch on some lamps or call attention to a lantern slide.

I know, from considerable experience with lay audiences of from 100 to 10,000 persons, that the lecturer who can best hold his audience is he who can clothe his well-ordered points with words as he goes along, neither memorising nor reading his delivered text, but using any little happening of the moment, an impromptu witticism or touch of humour to leaven his more serious remarks, and to bring the really important items into sharp and unmistakable contrast. He must, above all things, see to it that everyone present can hear every word he says, not because he shouts, but because his diction and enunciation are clear and tempered to his surroundings. Finally, he should resume his seat and silence, when the audience would be quite glad to hear him for another ten minutes. M.I.C.E., M.I.M.E., M.I.E.E.

January 29th.

Electrical Engineers—and Others

I notice that many persons who are not call themselves "electrical engineers," and thus mislead the general public. Could we not get a Bill passed by Parliament to limit the term "electrical engineer" to chartered electrical engineers, and in that way improve the status of the profession? If we had a definite status in law then the quality of electrical work would improve, since the public would insist on all important electrical work being supervised by a genuine "electrical engineer."

One of your correspondents recently said: "Electricity supply has always been held back in this country by unnecessary regulations," but surely that must be so in a country where an engineer has no official standing.

January 30th. A.M.I.E.E., Assoc.A.I.E.E.

A Fatality at Armagh

I would like to correct a statement which appeared in the ELECTRICAL REVIEW of January 26th under your column headed "Notes," when a paragraph was inserted to the effect that two boys had been killed at Armagh when a line which was charged at 11 kV fell into the street.

The facts of the case are that the line in question was a two-wire service line at 230-V above earth which was constructed alongside a lane leading to some farms on the outskirts of Armagh. There was, however, an 11-kV line in the vicinity, but this neither came into contact with the service line in question nor the unfortunate victims.

From marks discovered on the wire it appeared that the breakage was due to some malicious person or persons having thrown a piece of wire across the two conductors, sufficient arcing having taken place to reduce the effective size of the wire, which caused the break. C. R. WESTLAKE.

Chief Engineer and Manager,
Electricity Board for Northern Ireland.

Belfast, *February 3rd.*

Variations in Distribution Voltage

In his letter in your issue of February 2nd Mr. Turnbull states that he has never seen a *non-automatic* tail-end booster, and is surprised that I use them. Well he still has something to learn, as they are very simple, cheap and economical, and quite satisfactory in actual use. They are regularly supplied by transformer makers of repute and therefore must have some merit. He suggests *automatic* tail-end boosters, but, as I have previously stated, these are too hopelessly expensive for the cases I have in mind. He does not include the cost of one of these in his estimate.

Now with regard to his supply to a small rural consumer a mile away from the tail end of his l.p. distributing mains. He assumes that the pressure drop on the e.h.p. from the power station to the first transforming point will be negligible, but I beg to doubt this. Also there will be the drop in *three* transformers, *viz.*: 11,000/460 V, 460/11,000 V, and 11,000/230 V, and to this must be added the drop in the l.p. distributor from the village 11,000/460 V transforming point to the 460/11,000-V transforming point, and on the l.p. service line from final 11,000/230-V transformer to the consumer's terminals. That is *seven* pressure drops in all with a *sum total of under 4 per cent.* Well again I doubt it. I have looked up many quotations from transformer manufacturers and find that the lowest full load drop quoted for single-phase 6,600-V, 5-kVA transformers at unity p.f. is 3.81 per cent., and therefore at 11,000 V and less than unity p.f. the drop in the two 5-kVA transformers alone will be at the very least 8 per cent.

Mr. Turnbull ignores my challenge to make a specific declaration that in the case of no single consumer on his system is the pressure variation beyond the plus or minus 4 per cent. limits. I repeat the challenge and suggest that he experiments with an accurate recording voltmeter.

Now with regard to his estimates of capital costs. His total cost of £58 2s. for one mile of 11,000-V line (excluding transformers, &c., and l.p. service line) is certainly an eye-opener and a detailed specification would be appreciated. He assumes that he can use the earth as a return. Has he ever tried this? I once experimentally used the lead sheath of an armoured concentric cable as a return for a single-phase line but as it immediately upset all the telephones in the vicinity I promptly discontinued the experiment.

As to his other estimates, capital charges at 6 per cent. strike me as being low. He states a m.d. of 350 W, but as he uses 5-kVA transformers I presume he means 3,500 W. At £3 10s. per kW this entails £12 5s. annual kW charge alone. Add 2,500 kWh at 0.3d., £3 2s. 6d.; 6 per cent. on his estimated total capital cost of £98 12s. 10d.—say £6; and his own figure for transformer losses of £2 10s. (I think it would be much higher), and this brings the estimated total annual cost to £23 17s. 6d., against his estimated revenue of £20 11s. 3d., making a gross *loss* of £3 6s. 3d. per annum, and, of course, the net loss would be much more. The lowest price I have for two 5-kVA, 6,600-V, single-phase transformers is £43 4s.; I should like to know where to buy two 5-kVA, 11,000-V transformers, fuse-gear, meter cupboard, &c., for £33 10s. I am sure a revised and more detailed estimate would interest your readers.

I note that he has allowed nothing for maintenance, wayleaves, or establishment charges. He states that "'Supply Engineer's' prices are too low; at ½d. he can hardly hire out cookers." Well, as a matter of fact we do hire out many cookers of the best make obtainable, and our net annual profits are very large and rapidly increasing. He also states "By widely scattered consumers I presume he means the ribbon type of building along a main road." That is exactly what I do *not* mean, but scattered small *isolated* consumers.

I quite agree that we should carry out any extensions that can possibly pay their way; but do not let us delude ourselves with optimistic estimates not based on actual experience and in which many factors are guessed at and many others conveniently omitted. SUPPLY ENGINEER.

February 3rd.

In your issue of January 26th, "Supply Engineer" stated that the light from gas mantles often varied by 35 per cent. in a few minutes. I should like to know where he has met such an atrocious example. Whatever we may think of gas, I believe in fair play, and in my experience the variation of gas light is considerably less than that from some companies' electricity mains. I should also like to know what is wrong with "Supply Engineer's" eyesight if he cannot detect such a large variation, even though it occurs gradually.

If a larger lamp is installed the variation still occurs, and is sufficiently noticeable to be very aggravating. And what about the efficiency? Or does he suggest installing three lamps in every living room, two to be used when the volts are up and three when they are down? A fine advertisement that would be!

Plus or minus 6 per cent. variation in voltage may be economically necessary in very sparsely populated districts, but in urban areas it is abominable, and the regulations should make some distinction. B.Sc., GRAD.I.E.E.

January 29th.

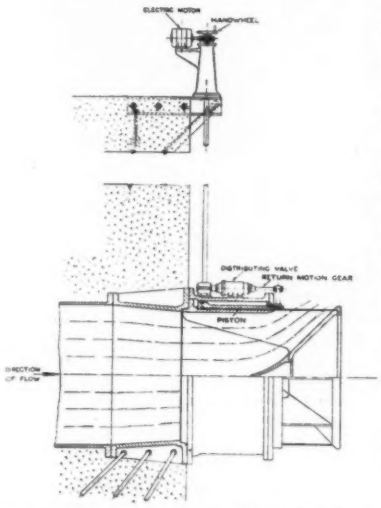
I have been awaiting Mr. Turnbull's explanation of the simplicity of maintaining voltage within ±4 per cent., and now we know. You just take a few (very few) light poles, and sling a steel-strand wire on them, total cost £50 per mile; apply 11,000 V to it and make earth connections at each end through transformers; and no one ever thought of it before. I should go a little further and raise the volts 6 per cent. at the farther end, and thus have an ideal distribution voltage. But what an appalling suggestion; even when carried out, and with a consumer taking 2,500 kWh per annum, with a maximum demand of 0.35 kW, this is costing him, according to his own showing, 1½d. per kWh.

My rural area consumers average about a tenth of this number of kWh per annum, so that I should not expect to receive more than £6 per annum, instead of £20, making a net loss on the consumer of about 50 per cent., without counting the occasional loss of life at the consumers' end. Still, I now understand how easy it is to keep within the 6 per cent. variation.

I am hoping to hear of a simpler and cheaper solution than my own for isolated consumers, that is, to run mains that would provide for 28-V drop on maximum demand, and a current-controlled tail-end booster, to give a 15-V boost on half-load. This is, of course, only where real automatic boost-

A Streamline Diffusing Discharge Regulator

THE method of dissipating the energy of a powerful jet of water by discharging it in the shape of a divergent hollow cone so that air friction and resistance absorb power rapidly and simultaneously break up the fluid into heavy rain has been applied to the speed regulation of hydraulic impulse turbines by projecting a ring of slanting diffuser vanes into the water flow inside the nozzle when load is suddenly rejected. The vanes give the water the necessary whirl, causing it to expand into a hollow cone as it leaves the orifice, thereby preventing the water from working on the buckets. Jets of water of many thousands of h.p. lose their power in this way and are discharged into unprotected tail races without adverse effects.



The hydraulically operated streamline diffusing discharge regulator

In the case of reaction turbines a relief valve by-passes the surplus water when load is dropped and the energy of this stream must again be dissipated. A needle nozzle of the impulse turbine pattern, but with the diffuser vanes always in the water flow, would meet the case if it were not unreasonable to create a jet just for the sake of diffusing it again. Also it would be necessary to make the valve considerably larger than the orifice in order both to accommodate a needle and to be able to release the water as a vortex.

The simpler way is to cause the upstream end of the needle to become the apex of the hollow cone of fluid by cutting the nozzle short and discharging all round the circumference. A further advantage is that instead of a needle subject to large hydraulic forces a balanced cylinder can be used for closing the annular orifice. Plant of this kind built to date by the English Electric Co., Ltd., alone can control and dissipate, as required, the energy of a total flow of considerably over four million gallons per minute, equivalent to nearly half a million horse power.

A New Zealand Example

An interesting example of the company's cylindrical balanced streamline discharge regulator is the 5-ft. diameter valve working at the Mahinerangi Dam of the City Council of Dunedin in New Zealand. The static head is 102 ft. maximum, but may be as low as 22.5 ft. when 550 cu. ft. per second, or roughly about 16 tons of water per second, has still to be discharged.

The discharge regulator comprises an inner body bolted rigidly to the pipeline and made up of a throat section tied by fish-shaped webs to the streamline dispersing cone. A sleeve or piston of stainless steel regulates the opening of the valve mouth by sliding along stainless steel rails carried by the inner body. Operating gear, consisting of a forked lever rocking about a pivot, is coupled to the sleeve and to a powerful headstock with non-reversible gearing for moving the piston and locking it at any desired opening. Wide and short waterways enable the apparatus to pass foreign bodies safely. Irrespective of the position of the sleeve, the water channels remain correctly streamlined and the valve will thus work smoothly without chatter or wear at all openings. By altering the slope of the dispersing cone of the regulator the most favourable amount of diffusion and an adequate discharge area can be chosen for any given set of conditions.

Control and Inspection Simplified

The piston being cylindrical, the internal radial water pressures on it are balanced and, since only a thin ring is subjected to pressure in an axial direction, there are no forces of any magnitude to overcome when the sleeve slides along the inner body, and no tendency to slam shut. The simplest form of control gear, *i.e.*, direct mechanical hand operation, can therefore be used. The operating gear being outside the valve and the valve itself not being surrounded by concrete, every part of the apparatus can be inspected easily and can be dismantled from above by lifting tackle.

The Mahinerangi Dam, New Zealand

The company also manufactures a design suitable for operation by the pipeline water pressure. An additional rustproof cylinder provides the servomotor chambers, sealed by rubber pad rings and controlled by a rustproof distributing valve, with return motion gear to make creeping by the piston impossible. Should the sleeve move even slightly, the distributing valve will at once admit pressure to the servomotor chamber to bring it back again. Hand gear allows for the manipulation of the distributing valve so as to secure the necessary discharge regulator opening. The operating pressure water is, of course, filtered.

If an electric motor is substituted for hand operation both the mechanically and hydraulically operated types can be worked by remote control. A float with a relay controls the motor, which increases the opening of the discharge regulator when the reservoir level rises and it becomes necessary to discharge more water.

Correspondence (*continued from opposite page*)

ing transformers are found to be economically impossible.

Mr. Turnbull still does not seem to grasp the meaning of "widely scattered consumers" in a truly rural area. These, in the main, consist of small farmhouses, dotted on the hillsides, and averaging half a mile apart, and I have numbers of these to reach as soon as I know how to do it, and keep within the limits allowed me, even though they would welcome the light with much wider variations in preference to candles and paraffin.

EDGAR COX WALKER,
Director.
Cark & District Electricity Co., Ltd.
Feethams, Darlington, *February 5th.*

A Prepayment Meter Problem

Mr. F. N. Rendell-Baker's method of dealing with this problem is certainly very interesting, but, although it may have proved satisfactory in his area, it offers many obvious disadvantages. One cannot expect consumers to be born "two-part-tariff minded," nor does one expect them to understand the intricate mechanism of so-called "too complicated" meters, but with reasoned arguments and a certain *savoir faire* the advantages derived from the use of two-part-tariff prepayment meters can usually be impressed upon the consumer.

Mr. Rendell-Baker's meter and collector combination is, in fact, a two-part-tariff prepayment meter with the drive from the meter element to the prepayment mechanism omitted and a slight modification in the internal wiring. It is difficult to understand, therefore, why the consumer should more readily grasp the meter and collector combination than the standard two-part-tariff prepayment meter. The complexity of the amount to be prepaid into the fixed-charge collector, coupled with the quarterly bill for electricity consumed, is more likely to rouse the consumer's suspicions than the all-prepayment or all-quarterly bill methods of payment.

So much for the consumer. From the supply authority's point of view the disadvantages are numerous, such as two apparatus instead of one for every installation, more complicated wiring, and, on the accounts and collecting side, double the amount of work, since every consumer enjoys the dual rôle of prepayment and quarterly consumer. By its simplicity, the two-part-tariff prepayment meter does away with all these disadvantages whilst adequately fulfilling its function.

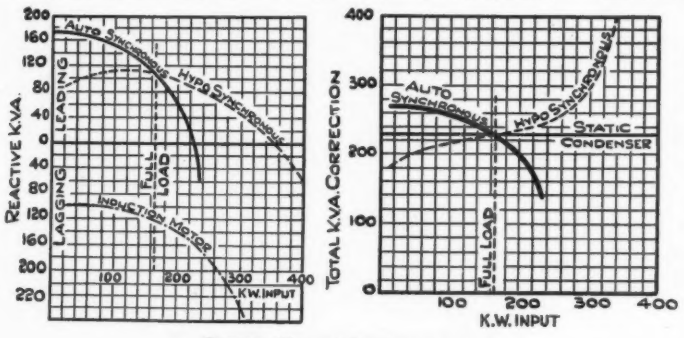
F. C. CROSSE.

London, S.E.23, *January 29th.*

Hyposynchronous Motors

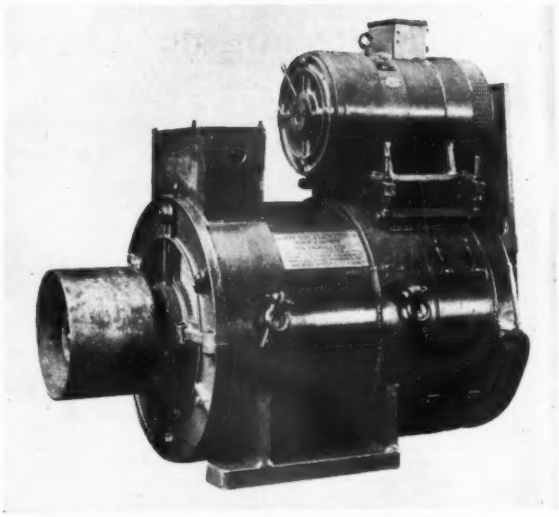
THE hyposynchronous motor which has been developed by Laurence, Scott and Electromotors, Ltd., consists of a standard induction motor with a Heyland exciter. For small high-speed machines the two form a single unit and for low-speed machines the exciter is driven from the main motor by "Tex-rope" belts; in the larger sizes the exciter is independently driven by a small s.c. motor. As its name indicates, the hyposynchronous motor operates below synchronism; it resembles an induction motor in that slip gradually increases with the load. The exciter comprises an induction-motor stator and a d.c. armature, and as the major portion of the energy absorbed is transferred to the rotor of the main motor the operating losses should be negligible. The motor is started in the ordinary way, but when it has reached full speed a change-over switch, which may be combined with the starter, cuts out the latter and introduces the exciter without shock into the rotor circuit.

The motor is designed to produce an almost constant wattless kVA component over an unusually wide range of load and corrects power factor automatically. It is unaffected by varying load temperatures and needs no attention to avoid excessive leading current at low load or lagging current at overload. Tests on which one of the accompanying curves was based show that it has an even higher pull-out torque than an ordinary induction motor. The machine shows to considerable advantage where the frequency of supply is irregular or where the machine driven has a high coefficient of irregularity



Comparative performance curves

or a large moment of inertia (*e.g.*, rolling mills). This merit is due to the increase of rotor flux with load (instead of a decrease as with the plain induction motor) which renders the machine insensitive to voltage and frequency variations.



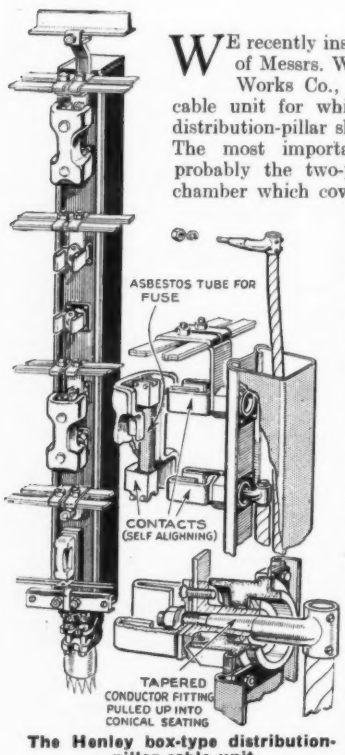
A 30-h.p., 200-V, two-phase, 735 r.p.m. hyposynchronous motor, 0.4 leading p.f.

It is claimed that the machine is unaffected by cyclic variations of the synchronous couple, which introduce parasitic losses due to harmonic fluctuations of the current and are difficult to measure. This gives a high overall efficiency, especially where the average load is less than the maximum, as with compressors. A recording-ammeter diagram on a 700-h.p., 120-r.p.m. hyposynchronous motor driving a rolling mill showed that the connection of the exciter decreased not only the fluctuations in current, but also caused the average current to fall from 450 to 250 A. The consequent reduction in feeder and transformer losses, by about 30 per cent., enabled the transformers, which were previously cooled by motor-driven fans, to deal with additional load.

The set can be separately operated with slip regulation resistances to allow extended play to flywheels and to even up energy consumption. The exciter can be fitted to any wound-rotor machine of 50 h.p. or over.

A Distribution Cable Unit

WE recently inspected the latest product of Messrs. W. T. Henley's Telegraph Works Co., Ltd., *i.e.*, the box-type cable unit for which the company's new distribution-pillar shell was really designed. The most important feature of this is probably the two-part, sheet-steel sealing chamber which covers the whole length of the unit, so that all the live parts at the back are totally enclosed and sealed. The turned edges of the U-shaped back section of the chamber closely-fit into grooves in the front sections, so making compound-tight joints, the two sections being tied together by one-bolt fixing sheet-steel clamping straps. Parkerising (rust-proofing) and the previous degreasing processes afford an excellent base on the surfaces of the chamber for subsequent painting.



The Henley box-type distribution-pillar cable unit

The complete unit is suspended from a tee-iron fixture across the top of and inside the shell, along which the unit will slide, before tightening the clamps, thus facilitating aligning. At the bottom, adjacent units are connected by channel-iron distance pieces, a hole at each end of a distance piece accommodating the bolt from the fixing block of the corresponding cable unit.

The top suspension and the bottom fixing arrangements should result in considerable saving of fitters' time, because there is no necessity to drill further holes. Similarly with the bus-bars, which are built up from standard laminations arranged as one set of two strips $\frac{3}{16}$ in. wide and $\frac{1}{4}$ in. thick (150 A) and twin sets of two, three, five and six strips $\frac{1}{4}$ in. wide and $\frac{3}{32}$ in. thick, the largest capacity being 1,000 A. The bus-bars are clamped between angle pieces from the top terminal of each fuse, slotted to receive the clamping bolts, and channel-top clamping pieces which are suitably coloured for phase identification.

When fixing a unit the bus-bar clamps and bolts are pushed aside from the angle bracket until the bracket and bars are in correct relationship, when they are replaced and tightened up. The porcelain insulation of each contact projects slightly through the front section of the chamber, and for fixing it is shouldered, the shoulder being clamped by a plate and screws. The conductor fitting, with its socket and grub screws, carries a tapered bolt which is nested into a conical seating in the contact block by means of a single fixing nut.

The earth end of the unit is of cast iron and is clamped to the bottom of the sealing chamber by lugs and suspended U-bolts. The one design of unit serves for two-, three-, four- and five-core cables, and, when required, the small fuse for the fifth core or public lighting control conductor, &c., is fixed at the bottom of the unit below the neutral links. Similar bus-bar arrangements exist for this small fuse as for the large ones.

It is an easy matter to remove the complete unit from the pillar shell. The bus-bar clamps are pushed aside, the suspension clamp is released and the bottom distance pieces are removed, when the whole unit can be pulled forward with the cable end. We suggest that because of the total sealing of the live parts, and the general flexibility of the unit, it should be particularly suitable for use in sub-stations.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Gas-discharge "Daylight" Lamp

A most effective demonstration of the new "Sieray W" gas-discharge lamp was staged last week by SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., at 39, Upper Thames Street, London, E.C.4. Without a doubt a very great stride forward has been made in improving the spectrum of these lamps by a special combination of metallic vapours and gases.

The "Sieray W" lamp

To demonstrate the improvement the 'Sieray," "Sieray X," and "Sieray W" lamps were placed in separate cubicles, each decorated in identically the same way with red, blue, orange and other colours. In the first two the red appeared brown, an apple as if it was completely brown and rotten, an orange like a lemon, and a banana quite green and unripe, and red in a carpet was quite indistinguishable. On the other hand, in the cubicle lighted by the "Sieray W," all colours appeared exactly as under a north light, the fruit appearing perfectly natural, and the true colour of the carpet being shown.

The new lamp includes a starting device embodying auxiliary electrodes in proximity to the main electrodes, the former being connected together through a resistance, but not to the lamp terminals. These electrodes have the effect of setting up preliminary discharges at the main electrode, thus starting the main discharge, which then carries the full lamp current and automatically cuts out the auxiliary electrodes. With this device the lamp will operate on an a.c. supply of 200 V and upwards. The new lamp, as in the case of the older types, has an efficiency of 40 lumens per watt, being loaded at 400 W, although experiments are being conducted with a view to bringing out a lamp with a considerably lower wattage. The lamp appears to remove the principal objection that has been raised by street lighting authorities to gaseous-discharge lamps. The list price is £2. It is covered by what is said to be the only British master-patent for discharge lamps.

A Battery Radio Receiver

In the new "Model 285" battery radio set which has just been introduced by the MARCONIPHONE CO., LTD., 210, Tottenham Court Road, London, the speaker is incorporated in the cabinet at the left of the chassis. The cabinet is of walnut and the set consists of a four-valve circuit embodying a variable-mu screen grid and power grid detector, followed by a high-ratio transformer coupled to a special dual pentode output stage. The maximum undistorted output is 1¼ W, and the the price is £11 17s. 6d.

A "Tong-Test" for Link Disconnecting Boxes

A new pattern of the "Tong-Test" ammeter, Type "E," has been developed by MESSRS. CROMPTON PARKINSON, LTD., Bush House, W.C.2, to enable currents to be measured in the links in underground disconnecting boxes of several standard makes. The "tongs" are specially shaped for insertion between the links and the dividing insulation. They occupy the smallest possible space, and are insulated to prevent damage arising from contact with live conductors, and safeguard the user against shocks.

Type "E" Tong-Test

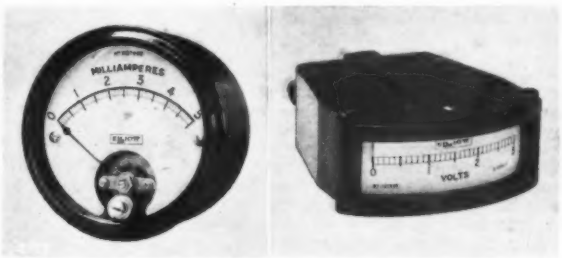
A hinged mirror is fitted on the movement unit to enable the pointer indication to be seen when the instrument is held vertically downwards at arm's length, as it must be, of course, with this type of box. The scale has two sets of figures, one for normal direct reading, and the other for reading by reflection. Like other instruments in the "Tong-Test" range, this new model will indicate on both a.c. and d.c. The accuracy obtainable is within B.S. second grade on a.c. circuits, and within approximately 5 per cent. on d.c.

The instrument is provided with one or more movement units as required, the standard ranges being 0/100, 0/200, 0/300, and 0/400 A.

Miniature Instruments

Two new types have been added to the series of miniature instruments made by MESSRS. ELLIOTT BROTHERS (LONDON), LTD., Century Works, Lewisham, S.E.13. They are known as the "Two-in. round" and "Miniature Edgewise" patterns, and represent the smallest d.c. type marketed by the company. Accuracy in accordance with B.S.S. 89 for first-grade instruments is guaranteed, and the weight is only 4¼ oz. for the round type and 8 oz. for the edgewise.

The movement, which consists of a pivoted moving coil rotating in the field of a permanent magnet, is similar in its electrical operation and characteristics to that of the larger moving coil instruments. The moving coil is wound upon a seamless aluminium former and is controlled by well-aged, non-magnetic



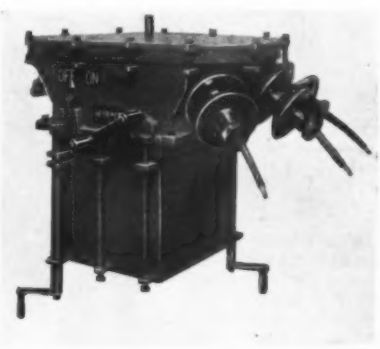
The Elliott "M.R.2" and "M.E." instruments

springs, which also act as ligaments to convey the current. It is mounted with tempered and polished steel pivots working in selected sapphire jewels, and is light and rigid, friction being reduced to a negligible factor. The magnetic system is so arranged as to provide a very high torque, and a well-aged and tested cobalt steel magnet ensures permanence of calibration. The heavy damping of the movement renders the instrument extremely dead beat, robust and capable of hard usage, although sensitivity and accuracy are maintained. Every instrument is checked against a master standard. Instruments are generally supplied with end zero scales, but zero centre scales can be supplied.

Another feature of the instruments is the simple form of flush mounting. The type "M.R.2," with a 2-in. circular dial, has a scale length of 1¾ in. and an angular deflection of 100 deg. The voltmeters have a standard resistance of approximately 200 ohms per volt, but models are also supplied at 1,000 ohms per volt. The edgewise pattern has a scale 2.125 in. long and a standard resistance of 500 ohms per volt (although 1,000 ohms per volt can be obtained when specially ordered).

An Outdoor Circuit-breaker

For the control of tee-off circuits for small consumers in rural areas MESSRS. A. REYROLLE & CO., LTD., Hebburn-on-Tyne, have developed their type "PLY 15/50" hand-operated oil-immersed circuit-breaker with compound-filled switch-hoist. The c.i. top plate carries the mechanism and the ¼-in. welded steel tank; on each side of it are three flanges to which cable glands or lead-in insulators can be bolted. Over-current protection on one, two or three phases is given by adjustable direct-acting series trip coils in ten ratings from 2.5 to 200 A. Circuit-breakers with trip coils rated at 15 A and upwards have a rupturing capacity of 50,000 kVA. The three sets of moving contacts, which have laminated brushes, heavy braking springs and arcing tips, are mounted on a common plunger bar. Automatic mechanical reclosing up to three times before locking out can be provided. These circuit-breakers have a maximum-current rating of 200 A at 15 kV, and can be pole-mounted or set on the ground. The tank capacity is 18 gal., and the weight, ready for service (excluding supports and framework), is 969 lb.



The Reyrolle "PLY 15/50" circuit-breaker

"Antishock" Flexible Cable

A new cable for portable appliances subject to strains, such as electric irons and vacuum cleaners, has been introduced by MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Salford, 6. It is claimed to be shock-proof, non-kinking, damp-resisting, and durable. The cord consists of two stranded copper conductors, covered by two layers of high-grade vulcanised rubber, with an outer sealed jacket of flexible rubber,

water- and shock-proof, which, in turn, is covered by a strong attractively coloured glazed yarn which adheres firmly and will not slide or unravel. The prices range from £1 2s. 6d. per hundred yards for size 14/36 (twin conductor) to £4 for size 110/36 (triple conductor).

An Architectural Lighting System

An architectural lighting system has been designed by STRAIGHT-LITE REFLECTORS, LTD., 73, Canonbury Road, London, N.1, which employs "Maxtrip 2" lamps. This lamp has an end-to-end filament, and has been designed to give a continuous line of light without dark spots. This has been obtained by fixing the plug connectors on to the side of the lamp instead of the usual cap on the end, thus enabling the lamps to be placed end on to produce a line of light without any break.

A feature of the "Straight-Lite" reflector into which these lamps fit is that no internal flexible cable is used, and yet, at the same time forty 30-W lamps may be placed end on—each lamp is 11 in. long—without the necessity for any external connection. This is accomplished by special non-corrosive alloy wire covered by a damp-resisting sleeve, which will withstand a temperature of 5,000 deg. F., and housed in a recess at the base of the reflector on the bus-bar principle. It serves the dual purpose of holding the indented lamp plugs in position, and affording the necessary electrical connection to the lamp. These wires, together with moulded connector blocks, are covered by metal channel pieces which complete the interior surface of the reflector. Moulded bakelite blocks insulate the contacts.

It will be seen from the illustration that the cabtyre is received by a special end connector with cement sealing. The prices of the lamps are: 30-W type 5s. 9d., and 60 W 6s. 6d.; the reflectors cost 6s. 9d. per lamp length when over two lengths long.

Flame-proof Mining Keys

The Type 1073 "Tangent" key

Recent introductions by MESSRS. GENT & CO., LTD., Faraday Works, Leicester, are two new "Tangent" keys, which are certified by the Mines Department as flame-proof and suitable for mine-signalling bells operated at a pressure not exceeding 25 V, or, for the petroleum industry on a.c. or d.c. circuits, up to 250 V. The two models which are available are similar, except that type 1071 is arranged for operation by pulling the handle forward—this has been found not to fatigue the muscles of the operator during continual use.

A Universal Wattmeter

The NIVEX INSTRUMENT & GAUGE CO., 3, Furlong Road, N.7, has sent us a sample of the new wattmeter which it is marketing at 17s. 6d. It can be used on either 230 or 200 V a.c. or d.c., a separate scale being provided for each. The lampholder is in one piece with the case of the wattmeter, which is plated.

The range is from 0 to 250 W a.c. or d.c. The flex, which is provided with a lampholder adaptor, is 2ft. 6in. long, and a ring is fitted into the black moulded handle for hanging the instrument on a wall.

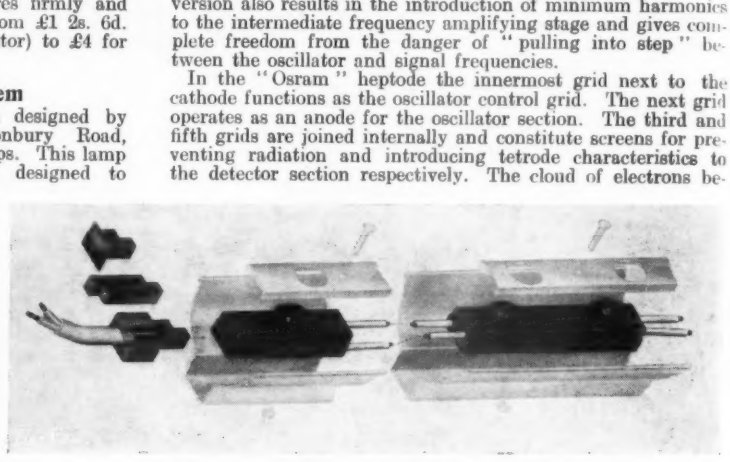
The "Nivex" lamp tester

An "Osram" Heptode Valve

In order to provide an efficient method of frequency conversion for superhet. receivers, the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has introduced a new heptode known as the "MX40." This is being made with an indirectly heated cathode and the standard 4-V 1-A heater, being thus suitable for a.c. mains receivers. It is constructed with five-grid electrodes in addition to the normal cathode and anode system.

The principle of the heptode is that the oscillator detector coupling occurs in the valve electron stream itself and is not obtained by external means. This ensures a very high degree of frequency conversion efficiency and, in addition, by careful screening within the valve, minimum radiation to the input circuits. The principle of heptode frequency conversion also results in the introduction of minimum harmonics to the intermediate frequency amplifying stage and gives complete freedom from the danger of "pulling into step" between the oscillator and signal frequencies.

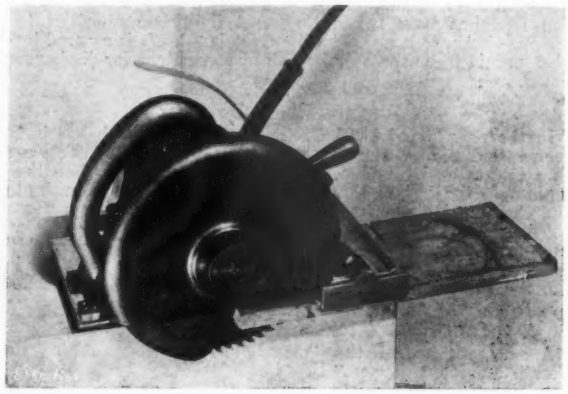
In the "Osram" heptode the innermost grid next to the cathode functions as the oscillator control grid. The next grid operates as an anode for the oscillator section. The third and fifth grids are joined internally and constitute screens for preventing radiation and introducing tetrode characteristics to the detector section respectively. The cloud of electrons between the oscillator anode and the inner screen grids constitute a virtual cathode, the electrons supplied from which are controlled by the detector grid. The fourth grid is the detector control and by means of its "variable-mu" feature enables control of amplification to be obtained by variation of its negative bias. The valve is useful in circuits employing automatic volume control where the maximum control is required and the number of control valves is restricted. A standard seven-pin base is fitted.



An "X-ray" view of the "Straight-Lite" reflector

A Portable Electric Saw

We have received particulars of a new portable electric saw obtainable from the SWIFSURE COMPANY, 146a, Queen Victoria Street, E.C.4, and MR. D. LANDALE, 36, Great King Street, Edinburgh. The saw is known as the "Swifsure," and is a compact, light (it weighs 17 lb.) and strong self-contained tool which incorporates a circular blade 8 in. in diameter, fitted with a swinging guard which automatically covers the blade as soon as the cut is finished. A riving knife is included, to prevent the blade from jamming, and also a ripping guide, which enables any width to be ripped off accurately.

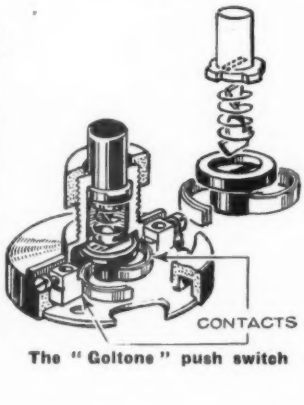


The "Swifsure" saw

The switch which controls the ¼ h.p. universal motor is contained in the handle, and it is claimed that the saw will rip 2 ft. of 1½ in. whitewood in 55 seconds. It is supplied at £13 10s. with one general purpose blade and 15 ft. of c.t.s. cable, although special blades for cross-cutting, ripping or smooth finish cutting, are also available, as are also metal cutting and grooving blades. The speed of the blade is 4,000 r.p.m. and the dimensions 12 in. by 8¼ in. by 9½ in.

A Moulded Switch

A recent development by MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Salford, is a small black bakelite push switch of neat appearance and sound construction. It is operated by pushing the plunger which alternately makes and breaks the circuit, and can be used for any appliances not rated above 2 A at 250 V, such as table lamps, radio sets, &c. The price is 1s. 3d., the diameter 1½ in., and the depth 1 in.



The "Goltone" push switch

Electricity Supply in the Irish Free State

THE latest report of the Irish Free State Electricity Supply Board covers the twelve months ended March 31st, 1933 (Government Publications Sale Office, Dublin, 1s.). The accounts show a surplus of £5,815, notwithstanding expenditure on coal due to the effect of drought on the operation of the Shannon water-power station and on repairing the damage caused by the blizzard in February last year. The total expenditure by the Board to the end of the period was £9,925,000, of which £749,000 represents the liabilities assumed by the Board in respect of undertakings transferred from local authorities. The total capital charges borne by the Board during the period were £573,000, and the rate of interest fixed by the Minister of Finance is 5¾ per cent. Revenue from sales of energy increased by over 10 per cent. to £1,044,000 at an average price per kWh sold of 2.09d., an advance of 0.05d on the previous year.

The number of kWh generated was 166 million and sold 120 million, increases of 14 million and 9 million respectively. The aggregate m.d. on the power stations was 59,500 kWh and the load factor 31.6 per cent. Expenditure on revenue account amounted to £477,000, an increase of £62,000, due partly to the abnormal expenditure referred to and partly to the cost of improving service to consumers. Included in this expenditure is £21,000 for coal and £52,000 for rates. The accumulated deficiency on profit and loss account at March 31st, 1932, £240,000, representing development charges, has been capitalised.

As yet no change has been made in tariffs except for cooking, for which the price was reduced in September, 1932, from 1¼d. and 1½d. to 1d. per kWh, coincidentally with the introduction of a hire scheme which is showing good results. Schemes for the hire of other appliances are under consideration.

The Board sold energy in 181 areas, of which twenty-five are classed as "rural" and "villages" with populations of less than 300 and only twelve have more than 10,000. There are also 100 authorised and "permitted" undertakings which had not been acquired by the Board, which sold between them 2,894,000 kWh; their combined population is 103,000.

Consumers supplied by the Board totalled 82,000, an increase of 4,500 for the year, about half the increase for 1932 and just over one-third of that of 1931. Omitting the Dublin Tramways and Ford's works at Cork, the industrial power load (motors above ½ h.p.) aggregates 46,000 h.p., which is 8,500 h.p. more than in the previous year and the highest advance yet recorded. It includes the first change-over from steam to electric drive in flour-milling. Institution loads connected or contracted for during the year covered nine for heating with a capacity of 2,760 kW; ten for cooking, 387 kW; five for hot water, 336 kW; and five for sterilising, 497 kW. For public lighting, sixteen new contracts were made, bringing the total to 164, leaving twenty-seven still unsupplied in areas where the Shannon supply was available, but in twenty of these the local authority had no power to impose a rate for the service. The consumption of the 15,000 public lamps (3,111 kW) was nearly eight million kWh, which produced a revenue of £61,000.

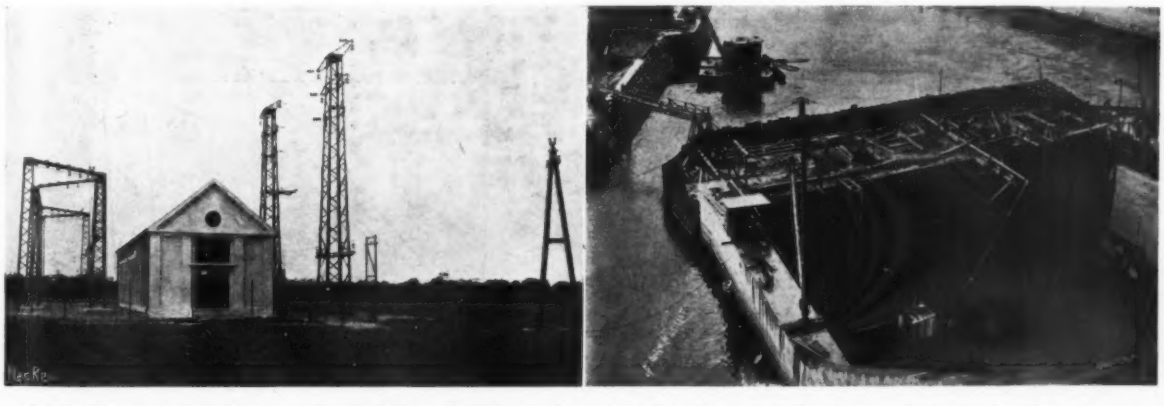
Contracts for installation work amounted to £50,000, on which the gross profit was 26.4 per cent. The net profit was £653. The installation department employed 162 electricians. Sales of appliances brought in £36,000, on which the gross profit was 18.6 per cent. and the net profit £485. More appliances (11,000 kW) were sold than in previous years through the permanent showrooms in Dublin, Cork, Limerick, Waterford, Dundalk and Athlone. There was a decrease of over £6,000 in total sales due to the closing down of temporary showrooms, but this was accompanied by a substantial reduction in expenditure. Outdoor salesmen, canvassers, literature and advertisement are employed to sell and promote the use of appliances, and demonstrations are given at public exhibitions. Close co-operation is maintained with educational establishments.

A sum of £365,000 was allocated to the installation of a fourth unit at the Ardnacrusha station, and further plant at the Pigeon House station, Dublin. The new set at Ardnacrusha is a 30,000-h.p. Kaplan turbine with 25,000-kVA 10.5 kV 50-cycle alternator. The original installation at the Shannon was described in the ELECTRICAL REVIEW in May, 1930, and improvements at Pigeon House in our issue of January 27th, 1933. Some particulars of the new plant are given on page 186.

New transformer stations erected during the year numbered eighty with 10,915 kVA of transformers. These brought the total number of sub-stations up to 649, with a total transformer capacity of 351,830 kVA, included in which are two 110-kV stations with a combined capacity of 83,000 kVA and a 6,320-kW frequency-changing station. Eighty-two miles were added to the h.v. system (sixty-eight overhead) and seventy-six miles to the l.v. system (fifty-four overhead); twenty miles of the overhead-l.v. lines were reconstructed or strengthened. The total mileage of the transmission and h.v. distribution systems was 2,600 miles, including 174 miles of 110-kV 0.147 sq. in. lines (114 double-circuit).

The power station at Ardnacrusha was closed down for 674 hours at nights and during week-ends in the summer for water economy, the load being transferred to the Pigeon House station. Included in the 150 million kWh generated at Ardnacrusha was 6¾ million kWh supplied to the electric boilers at Pigeon House and Cork power stations, these steam stations generating 22 million kWh and 114,000 kWh respectively.

The strength of the Board's regular staff was 1,617, of which 171 are classified as engineers and technical staff, and 287 as electricians and linesmen; eighty-five of the former and all electricians except two were employed in the fifteen district offices. Marked improvement has followed the mechanisation of the system of accounting, and a substantial reduction in outstanding debts has resulted. Bills are now issued to one-half of the consumers each month. The report includes details of the tariffs in force, and an appendix giving an account of the effects of the snowstorm of February 24th, 1933, on the Board's transmission system.



The 38-kV transformer station at Portlaoighise (Maryborough) and (right) the new coffer dam at Ardnacrusha, the Shannon hydro-electric station, in course of construction

Publications of the N.P.L.

THE National Physical Laboratory published the results of its researches into the illumination-response characteristics of vacuum photo-electric cells of the Elster-Geitel type in a paper bearing this name that was read before the Physical Society on January 19th. Other researches of electrical interest were described in the following publications: "A Power Amplifier for Laboratory Use," by R. S. Dadson (*Journal of the Royal Society of Arts*); "A Portable Brightness Meter," by B. H. Crawford (*Journal of Scientific Instruments*); "Valve Oscillators of Stable Frequency," by F. M. Colebrook (Radio Research Report No. 13); "Thermal Insulation," by E. Griffiths (*Journal of the Royal Society of Arts*); "Refraction of Ultra-short Radio Waves in the Lower Atmosphere," by R. L. Smith-Rose and J. S. McPetrie (*Wireless Engineer*); and "Reduction of Filament Battery Coupling in Amplifiers," by W. L. Watton (*Wireless Engineer*).

Wood Insulation

A new material with a number of electrical applications

WOOD is an organic chemical compound, largely cellulose and lignin. It decays easily unless seasoned by drying in air or hot kilns, or treated chemically. The safe working stresses of the common constructional grades in compression perpendicular to the grain lie between 900 and 1,300 lb. per sq. in. Attempts to improve its mechanical strength and electrical insulating properties have been numerous and varied.

When reduced to a fibrous powder, wood is commonly em-

An example of the use of "Permali"—the base of a large grinding machine

ployed as a "filler" for resinous compounds which can be formed into most shapes desired by a process of moulding. Certain characteristics of this material can be avoided by impregnating wood in its natural state with oily substances, though this process lacks stability, since in course of time, aided by heat and compression, the impregnating medium is apt to exude.

"Permali" is a new insulating material which is said to combine the advantages of both these methods of treatment, at the same time minimising their limitations. It consists of wood impregnated with synthetic resins without altering its physical state. Thus the wood retains its fibrous nature while acquiring the stability and dielectric properties of a moulded substance. This new material can be supplied in various forms, and its mechanical and electrical applications appear to be expanding quite rapidly abroad.

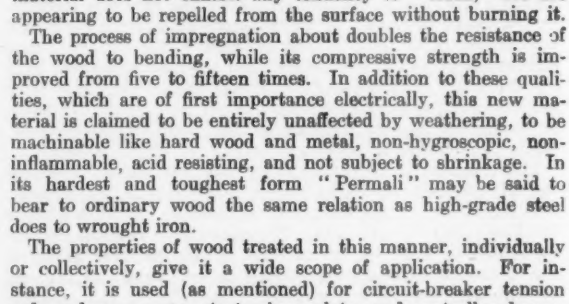
In appearance, "Permali" is not unlike ordinary well-selected wood, slightly discoloured, or multi-ply wood of varying degree of grain closeness. When dielectric strength is the primary requisite, and such mechanical strength as is normally associated with a good beech or similar wood will suffice, simple "Permali" is employed; circuit-breaker tension rods are an example of its common use in this form. When, however, mechanical strength is the prime consideration, combined nevertheless with good insulating properties, *i.e.*, for bus-bar supports under short-circuit conditions, then the laminated and compressed forms are used.

The accompanying curves indicate that, when required, the dielectric strength of "Permali" may be made to approach that of bakelite. When subjected to an electric arc this material does not exhibit any tendency to "track," the arc appearing to be repelled from the surface without burning it.

The process of impregnation about doubles the resistance of the wood to bending, while its compressive strength is improved from five to fifteen times. In addition to these qualities, which are of first importance electrically, this new material is claimed to be entirely unaffected by weathering, to be machinable like hard wood and metal, non-hygroscopic, non-inflammable, acid resisting, and not subject to shrinkage. In its hardest and toughest form "Permali" may be said to bear to ordinary wood the same relation as high-grade steel does to wrought iron.

The properties of wood treated in this manner, individually or collectively, give it a wide scope of application. For instance, it is used (as mentioned) for circuit-breaker tension rods and cross arms, starter base plates and controller drums, transformer terminal boards and coil wedges, meter and contactor panels, overhead-line cross arms and bird guards, insulator pins, operating rods, insulating stools, railway insulating fish plates and soling plates, battery room flooring, silent gear wheels, &c.

The processes necessary for the commercial production of the material, including careful selection of the wood, the preparation of the phenol-aldehyde resin, the vacuum-pressure cycle of impregnation, the compression of certain of the im-



The dielectric strength of "Permali" compared with that of bakelite

pregnated woods, the methods of machining and varnishing the finished article, are the result of experiments undertaken in various laboratories, some purely scientific, others more industrial in their object. The material is supplied in this country by the British Permali Company, 32, Old Queen Street, Westminster, S.W.1.

Official Visits to the British Industries Fair

THE British Industries Fair opens on February 19th and continues until March 2nd. The Advisory Committee of the Electrical Section have arranged for official visits to be paid to the Birmingham Section of the Fair by the following associations connected with the electrical industry:—

Tuesday, February 20th.
ELECTRICAL ASSOCIATION FOR WOMEN (Birmingham and Midlands Branch). (Tea.)

Thursday, February 22nd. Luncheon.
INSTITUTION OF ELECTRICAL ENGINEERS (South Midland Centre).
ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.
ELECTRICAL CONTRACTORS' ASSOCIATION.
ELECTRICAL CONTRACTORS' ASSOCIATION OF SCOTLAND.
ILLUMINATING ENGINEERING SOCIETY.
ASSOCIATION OF STEEL CONDUIT MANUFACTURERS.
MUNICIPAL TRAMWAYS AND TRANSPORT ASSOCIATION.
TRAMWAYS, LIGHT RAILWAYS AND TRANSPORT ASSOCIATION.
INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION (Scottish, North-East and Mid-East Centres).
OVERHEAD LINES ASSOCIATION.
Speaker: Mr. W. B. Woodhouse, M.I.E.E., engineer and manager, Yorkshire Electric Power Co.
Conference. Illuminating Engineering Society.

Friday, February 23rd. Luncheon.
ASSOCIATION OF MINING ELECTRICAL ENGINEERS.

Saturday, February 24th. Luncheon.
ELECTRICAL POWER ENGINEERS' ASSOCIATION.
ELECTRICAL ASSOCIATION FOR WOMEN (Demonstrators' Circle).
Speaker: Mr. F. Forrest, M.I.E.E., city electrical engineer, Birmingham.

Saturday, February 24th.
STUDENTS' SECTION, SOUTH MIDLAND CENTRE, I.E.E. (Tea.)

Monday, February 26th.
ELECTRICAL ASSOCIATION FOR WOMEN (Rugby, Cheltenham, North Midlands and Gloucester branches). (Tea.)

Thursday, March 1st. Luncheon.
INSTITUTION OF ELECTRICAL ENGINEERS (Council).
INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION (Council).
BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION.
ELECTRICAL WHOLESALERS' FEDERATION.
INCORPORATED ASSOCIATION OF ELECTRIC POWER COMPANIES.
PROVINCIAL ELECTRIC SUPPLY ASSOCIATION.
ASSOCIATION OF CONSULTING ENGINEERS.
LONDON ELECTRICITY SUPPLY ASSOCIATION.
BRITISH ELECTRICAL AND ALLIED MANUFACTURERS' ASSOCIATION (Council).
Speaker: The Hon. Oliver Stanley, M.C., M.P. (Minister of Transport).

The annual dinner of the South Midland Area of the British Electrical Development Association will be held at the Queen's Hotel, Birmingham, on Thursday, March 1st.

Parliamentary News (BY OUR SPECIAL REPORTER)

IN the House of Commons on February 1st Capt. Balfour asked the Under-Secretary of State for Air whether, in view of the recent air accidents caused by aircraft colliding with wireless masts and overhead electric lines, he would state whether negotiations had yet been concluded between the Air Ministry and the Electricity Commissioners with a view to the immediate adoption of increased safety measures to prevent similar occurrences; and whether he was satisfied that the existing regulations requiring suitable signals to be placed as far as possible on fixed obstacles dangerous to flying within a zone of 500 yds. of all aerodromes was sufficient safeguard.

Sir P. Sassoon said he would refer the hon. member to an answer given on December 20th. The whole question raised such involved technical issues that he could not amplify that answer in the House. He was, however, communicating with the Minister on the subject. As regarded the last part of the question, the 500-yd. zone was based on the Convention for International Air Navigation. The extension of this zone to 1,000 yds. in this country was under consideration.

Radio Interference

On February 1st Mr. Hanley asked the Postmaster-General if he was aware that the broadcasting stations at the Eiffel Tower and Luxemburg had failed to comply with the Lucerne wavelength plan; if he had addressed protests to the governments concerned; and what replies he had received.

Sir E. Bennett, Assistant Postmaster-General, said he was aware that the broadcasting stations mentioned were using wavelengths which were not allotted to them in the Lucerne Plan. Representations had been made to the French Administration as regarded the Eiffel Tower, but although a slight change had been made, in order to avoid interference with Daventry, the station was still using a wavelength to which it was not entitled under the Plan, and the Postmaster-General was still in communication with the French Administration on the subject. The Luxemburg Government refused to sign the Lucerne Convention; and its insistence on using a long wavelength, contrary to the provisions of the Plan, was causing difficulty in several countries. The position was under consideration by his department in consultation with the British Broadcasting Corporation, but the P.M.G. had not yet made representations to the Luxemburg Administration on the subject.

On February 5th Sir Gifford Fox asked the Postmaster-General whether he was satisfied with the progress being made in the elimination of interference with wireless reception; and whether he anticipated that his present arrangements would result in the virtual elimination of such interference in this country in the course of the next two or three years.

Sir K. Wood said that the question of eliminating electrical interference with wireless reception was at present under consideration by a committee appointed by the Institution of Electrical Engineers, on which the B.B.C. and the Post Office were represented, in addition to the electrical and wireless interests concerned. Pending the receipt of the committee's report he could not express an opinion on the prospects of the complete elimination of such interference. In the meantime, the Post Office was not relaxing its efforts to deal with the difficult problem of tracing the cause of interference in individual cases and urging—for the most part with success—the fitting of remedial devices.

The Electricity (Supply) Bill

On February 2nd Mr. Thorp moved the second reading of the Electricity (Supply) Bill, which, he explained, had been introduced because, with the very considerable increase which there had been in the supply of electricity, legislation had not kept pace with the requirements of the various undertakers and suppliers. The main object of the Bill was to avoid piecemeal applications to Parliament for statutory powers to lay electric wires and so on, and the Bill was introduced to bring the law up to date. The measure had the approval of the Electricity Commissioners, among other bodies.

Clause 1 sought to remove an anomaly due to the fact that in 1882 there were no county councils. Not, therefore, being defined as highway authorities, they had no power to take up roads. Clause 2 gave power to undertakers to lay electric cables in roads not repairable by a local authority, with proper safeguards for compensation and restoring the roads afterwards. The remaining clauses, in the main, had precedents. They had been altered only to bring them into line in a suitable form for legislation in a public Bill.

In seconding, Mr. Lockwood said that the clauses of the Bill could be divided into three classes; those which dealt with existing anomalies, those required by undertakers for more properly carrying on their work, and those which, in view of modern conditions, were necessary for their proper protection. While there already existed legislation enabling undertakers to buy land for sub-stations, it was unreasonably expensive and protracted. The Bill proposed that the procedure should be simplified and expedited. The measure also proposed to give undertakers powers to make rules and regulations to ensure the safety of buildings.

In the short debate which followed the Bill received general support, but several members foreshadowed amendments in Committee. Sir F. Fremantle said that the power given under the Bill to enter a building after it had been completed and electricity had been supplied was useless. What was needed was power to enter buildings, under such conditions as might be prescribed in Committee, during the course of construction to see if the regulations were being properly observed.

Mr. Parkinson, from the Labour benches, although not voting against the second reading, reserved, on behalf of the Opposition, the right to put down in Committee amendments in respect of matters which, in the interests of consumers and local authorities, should be given further consideration.

Sir G. Hume, in agreeing that the Bill was eminently one for consideration in Committee, declared that the time had come when the House of Commons should have an opportunity of taking a bird's-eye view of the whole of the various powers drafted into private Bills so as to be able to determine whether the accumulated force of these powers was such as to interfere unduly with the rights of private citizens.

Commander Cochrane was apprehensive of the interests of consumers being adversely affected, but Mr. Herbert Williams pointed out that, although this country was the pioneer in electricity, Parliament, instead of helping, largely hindered, and it was not until the 1919 Act which set up the Electricity Commission and also, to some extent, liberated enterprising people, that we really started to make progress.

Mr. Geoffrey Peto thought that the Electricity Commissioners might have put something in the Bill to show that they had considered the consumer.

The Government's approval was given to the Bill by Lt.-Col. Headlam, Parliamentary Secretary to the Ministry of Transport, who said that no objection would be raised to the second reading. Most of the provisions of the Bill already existed in a large number of private Acts belonging to electricity undertakings. The Bill was, in the main, non-controversial, and if passed would save considerable future expenditure on private Bill legislation.

Mr. Clarry said that the great gas undertakings supported the Bill, and the measure was read a second time.

Work at Dollis Hill

On February 5th Sir F. Fremantle asked the Postmaster-General whether it was proposed to carry on research work on behalf of the British Broadcasting Corporation at the new Post Office Research Institution at Dollis Hill; and, if so, what sum was to be spent by his department annually on such research.

This photograph, taken last Sunday, shows the Anglo-American cable, which was damaged during the recent storms off the Cornish coast, being repaired at Sennen Cove

Sir K. Wood said that no research work was being carried out at Dollis Hill on behalf of the British Broadcasting Corporation, and no such work was in contemplation, but some of the results of the wireless research work of the Post Office were of benefit to broadcast listeners.

Expenditure on Telephone Cables

On February 5th Sir Philip Dawson asked what amount the Post Office had spent in the year ended December 31st last on telephone cables and cables in general; and what amount it proposed to spend in the current year.

Sir K. Wood said that purchases of lead-covered paper-core cables (including armoured cables) fell into two classes:—(1) Cables purchased from and laid by contractors; (2) cables purchased from contractors and laid by the Department's own workmen. As regarded (1) the orders placed or expected to be placed were: Year to December 31st, 1933, £240,000; year to December 31st, 1934, £250,000. As regarded (2) the amounts spent or expected to be spent were: Year to December 31st, 1933, £520,000; year to December 31st, 1934, £450,000.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The British Industries Fair

A new system of admission has been arranged for the British Industries Fair which opens on March 19th. Home and overseas trade buyers will be charged 2s. for a badge admitting the holder to both the Birmingham and London sections throughout the Fair period. These badges can only be purchased at the Fair and on presentation of a trade card, or of the invitation ticket issued by the Fair authorities. The badges cannot be purchased by exhibitors for issue by them to their customers and clients. The public will be admitted all day at 2s. each as in previous years, while works parties will be admitted on Saturday, February 24th, at 1s. per head.

The Birmingham Chamber of Commerce has established an Accommodation Department to assist visitors to find sleeping accommodation. Visitors who experience any difficulty are invited to communicate with Mr. C. Elliott, general manager, British Industries Fair, 95, New Street, Birmingham.

A "Wizard in the Wall" Sign

A "Wizard in the Wall" sign

We reproduce herewith a photograph sent us by Mr. G. T. Garwood, engineer and manager of the West Hampshire Electricity Co., Ltd., which shows an illuminated sign which the company is displaying in its area in support of the E.D.A. "Wizard in the Wall" campaign. The sign, which was constructed by the company's Ringwood district works staff, is approximately 15 ft. high by 11 ft. wide and when floodlighted at night is an arresting sight.

Dundee and Electrical Trading

A proposal to supply electrical domestic appliances on hire or hire-purchase was discussed at a recent special meeting of Dundee Electricity Committee, and is to be investigated by a sub-committee. Mr. D. H. Bishop, the electrical engineer, in a report, stated that the time had arrived for the Corporation to take advantage of the power which it possessed to put such schemes into operation. He suggested the expenditure of up to £3,000 as required on apparatus and wiring to allow a start to be made. He also advocated the establishment of a showroom. In the course of the discussion by the Committee, Bailie Blackwood condemned the scheme on the ground that it would interfere with the business of private traders. The recommendations came from the Electricity Commissioners and were only the views of one or two men. The Convener of the Committee said he had definite assurance that outside contractors had no objection to the scheme.

The F.B.I. Business Forecast

The "Business Forecast" published in the Federation of British Industries' "Business Barometer" states that while world recovery may be expected to continue to make headway in various directions the possibilities of expansion in general both at home and abroad are still severely limited. Attempts, therefore, to accelerate the pace of revival may lead to setbacks in certain directions. The recent improvement which has been largely confined to the domestic markets of the countries concerned may begin to spread to various other sections of the international field. Unfortunately, the steady increase in exchange restrictions, import quotas, special tariffs and the like may result in the expansion in new directions being largely offset by contraction in existing channels. It is too early to forecast the repercussions of President Roosevelt's new monetary policy on the foreign exchange situation, but it is difficult to avoid the conclusion that if it is pursued to its logical conclusion it must, unless suitable counter-measures are taken by this country and others, intensify competitive currency depreciation in various directions. In any event it must postpone still further the resumption of an active foreign investment policy by Great Britain.

Birmingham Electrical Contractors' Dinner

The annual dinner of the Birmingham Branch of the Electrical Contractors' Association was held at the Imperial Hotel, Birmingham, on February 2nd. Mr. H. Mountford presided, and those present included Mr. J. Orringe (president of the Association), Professor W. Cramp (Electrical Engineering Department, Birmingham University), Mr. F. Forrest (Birmingham city electrical engineer), Mr. E. J. Jennings (commercial manager, Birmingham Electric Supply Department), Mr. S. T. Allen (Central England Engineer, Central Electricity Board), and Mr. J. Parkinson (president of the Birmingham Electric Club). Mr. Forrest, in replying to the toast of "The Electrical Industry," proposed by Professor Cramp, said that suburban railway electrification was a matter he had much at heart. He thought it was a pity that with a great national Fair at Castle Bromwich, with visitors from all parts of the world, there was not a single yard of electrified railway line in and around Birmingham. Speaking of Birmingham's electricity undertaking, Mr. Forrest said it was doubling its output every seven years. Although the output was the largest of any municipally controlled undertaking in Great Britain, they could look forward with complete confidence to doubling it during the next seven years. Professor Cramp said that the grid scheme had been carried out with sterling honesty of purpose so far as the industry was concerned. Already there was a move to try to provide national distribution as well as national transmission. Referring to the question of training for the industry, he suggested that the liaison between those who were training the young men and those who were to make use of their services was not close enough.

Works Visit

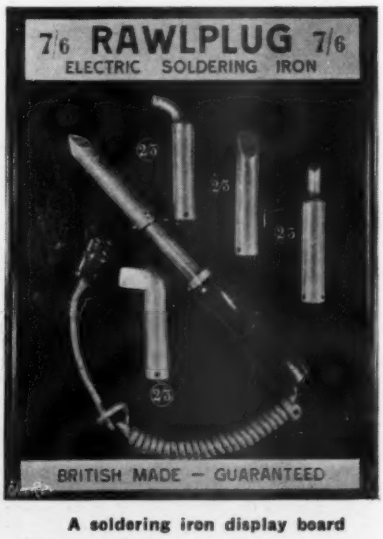
The Manchester and North-West Section of the Electrical Power Engineers' Association paid a visit to the works of Messrs. Ferguson, Pailin, Ltd., Higher Openshaw, Manchester, on January 27th, and made a comprehensive tour of the factory. Demonstrations were made in the mechanical proving house, which contains apparatus for static and impulse pressure tests for the routine testing of circuit-breakers and similar pressure chambers, the 500,000-V high-voltage laboratory, general test-bed, and the research laboratory, which contains instruments for the precision testing of instrument transformers. Interest was shown in the company's welding school and demonstrations were also staged on the sand blasting and metallisation plants. Other manufacturing processes inspected included the machine shops, tool room, bakelite department, and oil circuit-breaker assembly, and all classes of switchgear. Tea was provided in the staff canteen.

Co-operation in Newcastle

We recently made reference to the fact that the North-Eastern Electric Supply Co. had undertaken to "service" cookers supplied by local electrical contractors. The official journal of the E.C.A. for February gives further particulars of the agreement which has been made. The contractors are expected to exhibit one or more cookers in their showrooms and they are given the use of the supply company's kitchen at Carliol House for the purpose of practical demonstrations. The company is prepared to assist contractors in selling cookers and agrees to maintain for a period of eight years any approved cooker connected to its mains. It also undertakes not to sell cookers direct to the public at less than schedule prices and to allow a discount of 15 per cent. on these prices to contractors who sell cookers under this scheme to the company's consumers.

Soldering Iron Display Board

The accompanying illustration shows a standard size board measuring 18 in. by 13½ in., displaying a soldering iron and four interchangeable bits made by the Rawlplug Co., Ltd., which is being distributed to the trade. The display board is supplied free on orders covering a minimum of three irons, in addition to the one which is mounted on the board.



A soldering iron display board

E.D.A. (North-Midland Area)

The North Midland Area of E.D.A. held its fifth sales conference at Leeds on January 31st, when Mr. N. McLean, A.M.I.E.E. (borough electrical engineer of Harrogate), delivered a lecture entitled "Sweden—Electrical." Mr. McLean gave a résumé of his recent tour of Denmark and Sweden and

detailed information concerning the power stations, particularly Tpollhatten. Interesting data were given about farming and dairy work showing the advanced stage of such work so far as electricity was concerned. A discussion followed in which Messrs. W. R. Brown, D. M. Fraser, and A. Wilde participated.

A Holophane Conference

A large number of works engineers from all over the country attended a conference held at the premises of Holophane, Ltd., Elverton Street, W., on January 30th. The engineers were welcomed by Mr. H. H. Thompson, managing director of the company, and lectures were given on "Holophane Service" by Mr. W. T. Dean (sales manager), "Science Behind Holophane," by Dr. S. English (research engineer), and "Scientific Illumination," by Mr. E. Stroud (chief engineer). Luncheon was taken at St. Ermin's Hotel, and in the afternoon further lectures were given on "Practical Industrial Lighting," by Mr. L. M. Tye (industrial engineer), and "Colour Lighting," by Mr. R. G. Williams (colour lighting engineer). During the day a visit was paid to the Battersea power station where a great deal of Holophane lighting has been installed. The proceedings were concluded with a dinner at the Criterion Restaurant.

New Blackpool Premises

The accompanying illustration shows the exterior of the imposing new premises of the Blackpool branch of Messrs. Hirst, Ibbetson & Taylor, Ltd., which have recently been completed. These modern stores and showrooms have been seven months under construction and embody many improved features of construction. The stores are fireproof, with quick despatch counters and well-designed stock bins, a dry temperature-controlled atmosphere keeping stocks in good condition. A test room has also been equipped so that radio sets and electrical appliances leave the premises in working order. The general showroom contains a well arranged display of lighting fittings, fires, domestic appliances, &c. Portraits of the principals of the company appear below.

The new Blackpool premises of Messrs. Hirst, Ibbetson & Taylor, Ltd.

Electrical Commercial Travellers' Dinner

The annual dinner of the Electrical Trades' Commercial Travellers' Association was held at the Criterion Restaurant, W., on February 2nd, Mr. P. N. King, chairman, presiding. In responding to the toast of the President, Mr. H. J. Terry, chairman of the London Electric Wire Co. & Smiths, Ltd., said that the association was founded in 1925, and at the end of the first year had a membership of eighty-four. At the end of 1933 the membership was 215. He had a great respect for the Association because of its charities, and he appealed to all employers in the electrical industry to refer to the Association when they needed representatives. The electrical industry was well served in respect of travellers; they were the outposts of the trade, and those who remained in the shelter of the office and the factory must very largely rely upon the information which the travellers gleaned in the course of their travels. The Association had made progress during the difficult times of the past four years.

Mr. T. W. Heather, vice-president of the Association, and sales manager of the General Electric Co., Ltd., in proposing the Association and its charities, said that commerce and industry had changed completely since the war. Electrical travellers were fortunate in being in an industry which was expanding, and in selling something that was in universal demand. The Association could achieve much in the industry, but at present its membership represented only a small proporiton of the gentlemen selling electrical products. They did not do sufficient in the direction of publicity, and more should be done to interest the principals in the industry. Replying to the toast, Mr. King said the Association was gathering power. A scheme was in course of preparation for the amalgamation of the various commercial travellers' associations in the country. Their benevolent fund was not a charity, and members had a right to demand assistance when they required it. Mr. S. Johnson made a special appeal on behalf of the Commercial Travellers' Schools.

Prices of Materials

Messrs. F. Smith & Co. report February 7th: No change in the price of copper (electrolytic) bars and wire rods and silicium bronze wire.

Messrs. Edward Till & Co. report, February 7th: India-rubber, Para fine, 4½d., ½d. inc.

Messrs. James & Shakespeare report, February 7th: Copper bars (best selected), sheet and rod, £64, £2 inc. Electrolytic copper sheets, no change. English pig lead, no change.

For Sale

The Dumfries Electricity Department has surplus plant for sale, including steam engines, air pumps, &c.

(See our classified advertisements.)

An Osram Automobile "Sparetainer"

A neat form of container, known as the Osram automobile "Sparetainer," has been produced by the General Electric Co., Ltd. This has been designed for the purpose of supplying spare automobile bulbs to motorists. Each package contains three lamps, but they are in perforated sections and by twisting off one section can be used at a time.

Recent Contract

The Roumanian Broadcasting Co. has placed an order with the Marconi Co. for the supply of two broadcasting stations, one with an aerial energy of 150 kW and the other of 20 kW aerial power. The 20-kW transmitter is now temporarily operating at Bod until the 150-kW station is completed, when it will be transferred to another site. The large station will operate on a wavelength of 1,875 metres.

Tramwaymen's Wages

The Sunderland Town Council is to restore the 2s. weekly economy cuts made in the wages of tramwaymen and busmen. Over 300 persons are involved.

Social Events

The Ferranti staff dinner and dance was held at the Midland Hotel, Manchester, on February 2nd, and 320, including a number of distinguished guests, attended under the chairmanship of Mr. V. Z. de Ferranti. Speaking of the rapid electrical development which was going on in the country at the present time, the chairman referred to the good work which is being done by the Electrical Association for Women. He also referred to the progress that had been made in all departments during the last year, particularly in the radio and other relatively new departments of the company, and he expressed confidence in the prospects of the future. Mr. P. J. Robinson, city electrical engineer, Liverpool, in proposing the toast of "The Ferranti Co.," said it always gave him pleasure to recall that its founder, the late Dr. Ferranti, was a Liverpool man. The Liverpool Electricity Department had recently placed an order for the 150,000th Ferranti meter to be installed in Liverpool. Mr. D. Z. de Ferranti responded. Mr. Arthur Whittaker proposed "The Guests," and Mr. C. D. Taite, who replied, said he was an "old boy" of the Ferranti school, having joined the staff in 1893. The toast of "The Chairman" was proposed by Dr. J. L. Miller, and the evening was concluded with dancing.

The "Clesco" Light Operatic and Dramatic Club is to be congratulated on its performance of "The Mousmé" last week. A cast which contained a good deal of talent, both musical and dramatic, was backed up by a small but efficient orchestra, while the numbers by Lionel Monckton and Howard Talbot remain as popular as they were twenty years ago. The original work has been revised to suit the use of modern stage-lighting, which was very well done. Great credit is due to the producer, Mr. W. E. Dossett.

Principals of Messrs. Hirst, Ibbetson & Taylor, Ltd.

Left to right: Mr. J. Hirst (managing director), Messrs. W. H. Swain and H. R. Taylor (directors), and Mr. C. H. Lockwood (Blackpool district manager).

The Magnet Amateur Dramatic Society of the General Electric Co., Ltd., is presenting "Almost a Honeymoon" by Walter Ellis at the Lesser Free Trade Hall, Manchester, on February 22nd and 23rd. The performances are in aid of the Electrical Industries Benevolent Association, and should, therefore, receive the warm support of the trade. A similar show last year enabled the Society to give the E.I.B.A. the sum of £50.

The staff of the Donovan Electrical Co., Ltd., Birmingham, paid their annual theatre visit to the "Cinderella" pantomime at the Theatre Royal, Birmingham, on January 31st. A company of about 100 from the Stechford works and the Birmingham office were entertained to tea by the directors earlier in the evening.

Prominent men at the recent Diesel-electric coach demonstration by the L.M.S. Railway

Left to right: Messrs. C. R. Byrom (chief operating manager, L.M.S.), W. A. Stanier (chief mechanical engineer, L.M.S.), Sir Harold Hartley (vice-president, L.M.S.), H. N. Gresley (chief mechanical engineer, L.N.E.R.), C. E. Fairburn (manager, Traction Department, English Electric Co.), G. H. Nelson (chairman and managing director, English Electric Co.), Sir Gerald Talbot and Mr. A. Winterbottom (directors of the English Electric Co.).

The North-Western Joint Board

The annual meeting of the District Joint Board of Employers and Members of Staff (Electricity Supply Industry) for the North-Western Area was held on January 30th in Manchester. Ald. T. E. Higham was re-elected chairman, and Mr. G. E. Smith vice-chairman. The employers entertained the staff representatives to luncheon at the Engineers' Club, and amongst the guests were Mr. R. Toynbee, president of the Electrical Power Engineers' Association, and Mr. W. A. Jones, the general secretary. Alderman Higham proposed the toast of the District Joint Board, and referred to the useful work performed and to the difficult problems which would have to be faced in the future. In particular he instanced the contemplated displacement of staff due to the changing conditions of the industry, and he urged the necessity of full co-operation of all undertakers to endeavour to reabsorb the displaced men. Mr. G. E. Smith responded. Ald. W. Walker proposed the health of the guests and Mr. Toynbee replied.

School of Electrical Domestic Science

A Press visit was made on Friday last to the London School of Electrical Domestic Science, Imperial Court, Basil Street, Knightsbridge, S.W., which was opened on January 29th. This school is the first of its kind in Great Britain, and it is the aim of Miss H. M. M. Minoprio, the principal, to provide theoretical and practical instruction in all branches of domestic electrification. There is a large hall equipped as a kitchen with a full range of electric cookers, washing machines, wash boilers, &c.; a lecture and demonstration room with vacuum cleaners, floor-polishers, &c.; and a reception room which will later be adapted for lectures. The total connected load at the school is approximately 45 kW. The electrical contractors were Messrs. Troughton & Young, Ltd., and many manufacturers provided electrical equipment.

Industrial Heating

In the article under the above heading in our issue of January 26th (page 114) reference was made near the end to the furnace designer's ideal of the "*greatest* possible difference between the temperature of the furnace and that of the elements." This, of course, should have been "*least* possible difference."

Amplifiers in the House of Lords

In the cellars beneath the House of Lords Marconiphone amplifying equipment has just been installed to replace an amplifier which has been used in the House for the last eight years. In the Chamber itself are four microphones: two are on a table in the centre, one facing east and the other facing west; two more are hidden beneath the table facing the Woolsack, of the magneto moving-coil type as used by the B.B.C. for outside broadcasts, and are capable of picking up speech at 35 ft. The amplifier has five stages and is battery driven throughout. The output is divided into five circuits, each with an independent volume control. The Chamber is equipped with sixty-five hand earphones, each accommodated in a special recess at the back of the seat, a special spring roller coiling up the wire as the earphone is returned to its socket.

Catalogues Required

Mr. R. Wright, radio and electrical engineer, of 571 and 573, Didsbury Road, Heaton Mersey, Stockport, asks for catalogues from manufacturers of radio and electrical accessories.

Trade Announcements

Copes Regulators, Ltd., Burleigh House, 5-11, Theobald's Road, W.C.1, announces that it has been appointed the sole distributor in Great Britain and the Dominions for thermo-electric pyrometers, recorders and heat control apparatus, manufactured by Ether, Ltd., Birmingham.

Callender's Cable & Construction Co., Ltd., has removed its Chester branch to Newgate House, 25, Newgate Street, Chester.

Messrs. Willis & Co. (Meritus), Ltd., have removed their works and offices to larger premises at 36, Wood Street, High Barnet, Herts.

Reduction of Capital

In the Chancery Division on Monday last Mr. Justice Eve had before him a petition by the Electrical Apparatus Co., Ltd., for the sanction of the Court to a reduction of its capital. Mr. Lindon, for the company, said they asked the Court to confirm the reduction of the capital to the extent of £38,000 on the A preference shares, forming part of the issue of £75,000, which were to be paid off and cancelled. These shares were held by a subsidiary company and there was no opposition. The A and B preference shares ranked the same in a reduction of capital, with a bonus, but the B shareholders had agreed to the proposal, as had all the A shareholders.

His Lordship approved the reduction.

New Catalogues and Lists

E. G. Acheson, Ltd., 40, Wood Street, Westminster, S.W.1.—A technical bulletin dealing with the advantages of colloidal graphite as applied to industry.

Colton Electrical Equipment Co., 12, Hamilton Road, Highbury, N.5.—A leaflet describing numerous "Colton" products.

Igranic Electric Co., Ltd., 149, Queen Victoria Street.—A leaflet describing the "Hodac" air-break circuit-breakers which are now being made by the Company.

British Insulated Cables, Ltd., Prescot, Lancs.—Catalogue of B.I. copper glazing sections and leaflet on static condensers for elimination of interference in radio reception.

Lancashire Dynamo and Crypto, Ltd., Trafford Park, Manchester.—A well-illustrated brochure describing the auxiliaries at Battersea power station driven by "Lancashire" motors.

Crossley Brothers, Ltd., Openshaw, Manchester.—January issue of the "Crossley Chronicle."

Batteries, Ltd., Hunt End Works, Redditch.—Leaflet 1934 describing emergency lighting schemes incorporating the "Nife" nickel-cadmium alkaline accumulator.

Hailwood & Ackroyd, Ltd., Morley.—A showcard reproduction from an an oil painting showing three ballet dancers and bearing the inscription "Hailware for delicacy and beauty."

Lady Reading presenting an "Ediswan" iron to Mrs. E. P. Wright during a social afternoon arranged by the E.A.W. in aid of the funds of the Personal Service League

Left to right: Mrs. Ll. B. Atkinson, the Marchioness of Reading, Margaret Lady Moir and Mrs. E. P. Wright.

Switchgear and Equipment, Ltd., 49, Queen Victoria St., E.C.4.—A catalogue of "SE" pull-down switchgear.

Cuthbert Andrews, 47, Red Lion St., W.C.1.—A fifty-six page booklet on the "Protexray Tube."

E. H. Dawson & Henckel, 42, Gray's Inn Rd., W.C.1.—A catalogue of "Dawsonday" and "Dawson" silvered glass reflectors.

Philips Lamps, Ltd., 145, Charing Cross Rd., W.C.2.—The January issue of "Philips News."

Marconiphone Co., Ltd., 212, Tottenham Court Rd., W.1.—A showcard and broadsheets advertising the "Lucerne Special."

Telegraph Condenser Co., Ltd., Wales Farm Rd., North Acton, W.3.—Two showcards advertising a mains interference suppressor and T.C.C. condensers.

Radiant Heating Co., 75, Cecil St., Birmingham.—Leaflet on the "Wellington" electric fire.

British National Electrics, Ltd., Mossend, Lanarkshire.—Leaflet describing the "Universal" vacuum cleaners which are now being manufactured in Great Britain.

Bankruptcy Proceedings

J. F. Creasey (trading as the Positive Electric Co.), electrical engineer, 673, Romford Road, Manor Park, and at Wanstead Park and East Ham.—This debtor, who failed last October, has lodged accounts showing total liabilities of £6,236 (ranking £4,949), and net assets of £1,109. According to the Official Receiver's observations, the debtor states that in 1915, with £50 capital, he commenced trading as an electrical engineer at 673, Romford Road, Manor Park, E., under the style of "The Positive Electric Co." That business consisted mainly of the installation of electric lighting and power under contracts, in addition to which during recent years he also dealt in wireless apparatus. Early in 1930 he opened a branch shop at 92, Katherine Road, East Ham, which he carried on under supervision in his own name, unsuccessfully at first, but latterly at a small profit. About June, 1931, he opened another branch under management at 6a, The Parade, Wanstead Park, E., under the style of "The Positive Electric Co.," and this business just about paid its way. In January, 1933, he lost a valuable corporation contract which he had held for a number of years. In 1933 a meeting of creditors was held and a deed of assignment of his property to a trustee was executed on September 14th, but the principal creditor would not assent thereto and these proceedings ensued. In February, 1933, he entered into partnership with another person as electrical engineers at 332, Ley Street, Ilford, under the style of "J. W. Watson & Co.," and about June, 1933, he received the requisite notice terminating the partnership. The debtor attributes his failure and insolvency to loss of the before-mentioned corporation contract, falling off of business due to loss of a competent sales manager through injury, and heavy overhead expenses. The public examination was held on January 31st before Mr. Registrar Warmington.

J. Hampson, wireless dealer, 131, Blackburn Street, Radcliffe.—Receiving order made January 26th on debtor's own petition. Public examination March 13th at the Court House, Bolton.

G. E. Hughes, electrical engineer, 90, Gibbet Street, Halifax.—Trustee, Mr. J. O. Morris, 71, Manningham Lane, Bradford, Official Receiver, released January 8th.

W. A. A. C. Robinson, electrical engineer, 10, Carnaby Street, Golden Square, W.—Last day for receiving proofs for dividend February 14th. Trustee, Mr. F. Vyvyan, Bankruptcy Buildings, Carey Street, W.C., Official Receiver.

R. F. Palmer, electrical engineer, 19, Church Street, Burnley.—Last day for receiving proofs for dividend February 14th. Trustee, Mr. J. W. Carter, District Bank Chambers, Blackburn, Official Receiver.

F. M. Emerson, wireless dealer, 120, Cape Hill, Smethwick.—Trustee, Mr. C. Hoult, 159, Great Charles Street, Birmingham, Official Receiver, released November 22nd.

F. O. Tosswill, electrical engineer, 60, Wodeland Avenue, Guildford.—Last day for receiving proofs for dividend, February 17th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

E. Ball, electrical contractor, Old Hall Street, Middleton.—Last day for receiving proofs for dividend February 14th. Trustee, Mr. R. K. Clark, Byrom Street, Manchester, Official Receiver.

Company Liquidations

A. & E. Durn & Co., Ltd., electrical contractors and wireless dealers, North Street, Romford.—Under the compulsory liquidation of this company accounts have been lodged showing liabilities of £1,029, against assets of £500 and a deficiency of £1,1529 as regards contributories, the issued capital consisting of 1,000 £1 ordinary shares. The Official Receiver, who is acting as liquidator, reports that the company was formed as a private company in September, 1929, to acquire the business of Albert James Durn, trading as A. & E. Durn & Co. The trading accounts showed a small net profit from the inception of the company down to the end of 1932, but a loss during 1933. In October, 1932, Durn agreed to accept a debenture for £250 in lieu of the £350 cash consideration, and on May 11th, 1933, he appointed Mr. P. H. Wingham as receiver on his behalf, execution having been levied by a creditor. The receiver continued the business, and on September 30th, 1933, sold the goodwill and the benefit of the tenancy agreement for £50 and the stock, fixtures and fittings for £200 to the Magnet Construction Co., Ltd. The failure of the company was attributed to fall in the value of its stock of wireless sets and accessories and to the large number of bad debts incurred.

Vernon Smith & Sons, Ltd., electrical engineers, &c., High Road, Chiswick.—Under the compulsory liquidation of this company, accounts have been lodged showing liabilities of £768, assets of £137, and a deficiency of £837 with regard to contributories, the issued capital consisting of 207 ordinary shares of £1 each. The Official Receiver (who is acting as liquidator) reports that the company was formed in April, 1919, to acquire the business of electrical engineers, ironmongers, &c., then being carried on at 117, 121 and 123, High Road, Chiswick. The purchase consideration was £1,000 in shares. A debenture for £500 was issued on November 20th, 1930, and eight days later Mr. R. G. Lowe was appointed receiver for the bondholder. The latter ceased to act on March 7th, 1931, and the debenture holder appointed himself as receiver. He is carrying on the business with a view to a sale, but states that up to the present he has been unable to find a purchaser. The failure of the company is attributed to disagreement between the directors and to want of working capital.

Radio Stores, Ltd., 148, Streatham Hill, S.W.2.—The statutory meeting of the creditors herein was held recently, at the offices of Mr. Primost, accountant, 1a, Wood Street, E.C. The statement of affairs showed ranking liabilities of £809, and net assets of £407, leaving a deficiency as regarded the creditors of £402. The company was formed in July of last year, taking over an existing business, and the vendor was allotted fully paid shares in payment of the assets transferred. Up to the time of the formation of the company the business was carried on successfully, but subsequently keen competition was experienced and a portion of the business had to be conducted under hire-purchase terms. It was estimated that since the registration the turnover had been about £860, with a gross profit of rather more than £100, and after allowing for all the expenses a net loss was incurred. Resolutions were passed confirming the voluntary liquidation, with Mr. Primost as liquidator, with a committee.

Radiolux, Ltd.—Winding up voluntarily. Liquidator, Mr. W. R. Dockrell.

"Sel-Ezi" Wireless Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. L. D. Woods, 150, Southampton Row, W.C.

Guaranteed Accumulator Services, Ltd.—Particulars of claims by February 17th to the liquidator, Mr. E. W. Atkinson, 158, High Street, Wealdstone.

Northern Electrical Wholesalers, Ltd.—Particulars of claims by February 17th to the liquidator, Mr. J. W. E. Rutherford, Exchange Buildings, Whitehead Street, South Shields.

Frank Taylor (Electrical Services), Ltd.—Meetings, March 2nd, at Standard Buildings, City Square, Leeds, to receive an account of the winding-up by the liquidators, Messrs. C. H. Baker and C. D. Buckle.

K.L.M. Radio Relays, Ltd.—Meeting, March 16th, at Bush House, Aldwych, W.C., to receive an account of the winding-up by the liquidator, Mr. W. Smith.

Meeting of Creditors

Collins, Brown & Co., Ltd., electrical and wireless dealers, 91, New Oxford Street, W.C.—At the statutory meeting of creditors on February 2nd, Mr. D. Daniels, one of the directors, occupied the chair, and it was reported that the shareholders had passed resolutions for the voluntary liquidation of the company, but no liquidator had been nominated. A petition for the compulsory winding up of the company had been presented by the largest trade creditors and the matter would come before the Court on February 12th. A balance sheet was submitted which showed gross liabilities of £2,544. The company was registered on April 5th, 1933, and 300 shares to the value of £1 each had been issuod as fully paid. Since the inception of the company there had been a loss of £1,643 on trading. The debenture was issued at the beginning of December last for cash and carried interest at the rate of 7½ per cent. per annum. Recently the Sheriff distrained, and the debenture holder had appointed Mr. G. E. H. Soames as receiver. After considering the position it had been deemed advisable to close the premises. The creditors decided that the petition presented to the Court should be supported.

Private Arrangements

E. W. Bland, trading as Bland & Ryan, Church Street, East Dereham, Norfolk, electrical engineer.—At a recent meeting of creditors a statement of affairs was presented showing liabilities of £606 and a deficiency of £362. It was reported that the debtor commenced the business in November, 1932, in partnership with another. In 1933 the partner retired from the business owing to illness. Owing to lack of working capital debtor was forced to borrow money from his parents amounting in all to £211. He stated that the deficiency had arisen by reason of expenses incurred at the commencement of the trading when trying to build up a connection and through the turnover being insufficient to cover the overhead expenses. The creditors decided that a deed of assignment should be executed to Mr. A. Cripwell, of Messrs. Corfield & Cripwell, 12, Cherry Street, Birmingham. It was also stated that the cash creditors would be prepared to reduce their claim to one half.

C. H. Denham, Street Lane Parade, Leeds, electrical engineer and wireless dealer.—A meeting of creditors was held recently at Leeds, when the representative of Messrs. Milne & Needham, Ltd., was elected to the chair. The statement of affairs showed ranking liabilities of £1,166, and net assets of £775, leaving a deficiency of £391. The estate showed approximately 13s. 6d. in the £. An offer was made of a composition of 10s. in the £, payable as to 5s. in four months and the balance by two equal instalments in eight and twelve months, but without security. It was decided that the matter should be dealt with under a deed of assignment in favour of Mr. T. G. N. Hollings and Mr. C. H. Baker, Standard Buildings, City Square, Leeds, as joint trustees. A committee was also appointed. The following are the principal creditors: General Electric Co., £132; Sun Electrical Co., Ltd., £119; Milne & Needham, Ltd., £104; Brook Motors, Ltd., £98; and Lighting Trades, Ltd., £84.

T. McKnight, 9, Tootal Road, Weaste, Salford, electrical and wireless contractor.—A meeting of creditors was held recently in Manchester. The statement of affairs showed liabilities of £533, and a deficiency of £384. It was reported that the debtor commenced business in January, 1931, without capital. He purchased the property for £600 on mortgage, and estimated his turnover at £10 per week. In March, 1933, he opened another shop at Eccles New Road, Salford, which was not successful and was closed in December last. The position was attributed to the losses sustained on the Eccles New Road shop, which amounted to about £200, losses on repurchases, and bad trade. It was decided that a deed of assignment already executed to Mr. H. C. Binns, Prince's Buildings, 31, Dale Street, Liverpool, should be confirmed and the estate realised.

Dissolutions of Partnership

Grantham Radio & Electric Supplies, electricians, 41, Sycamore Road, Smethwick.—Messrs. W. A. Green and J. T. Williams have dissolved partnership.

Parsons Green Radio Store, wireless dealers, 187, New King's Road, Fulham, S.W.—Messrs. R. Saville and H. W. Worsley have dissolved partnership.

West End Radio, wireless engineers and dealers and electrical engineers, 25, Cog Lane, Burnley.—Messrs. W. Parrington and J. Alderson have dissolved partnership. Mr. Alderson will attend to debts and carry on the business at 20, Dall Street, Burnley.

Electricity Supply

Lighting, Domestic, Power

Abergele.—REDUCED CHARGES.—The North Wales Electricity Distribution Company has decided to reduce the charges for electricity from 8d. to 7d. per kWh, and the "residential tariff" is to be reduced by 25 per cent.

Allendale (Northumberland).—STREET LIGHTING.—The Parish Council has obtained sanction to borrow £980 for electric street lighting.

Anglesey.—EXTENSIONS.—Consideration has been given by the County Council to plans submitted by the Joint Electricity Authority for extensions of supply in Anglesey by the North Wales Power Co. to the borough of Beaumaris and places *en route* to Caergeiliog Valley, Trearddur Bay, Rhosneigr, and the parishes of Llanfair P.G. and Penmynydd.

Australia.—CONTROL OF SYDNEY UNDERTAKING.—A Bill to be introduced by the New South Wales Government proposes that the electricity undertaking of the Sydney City Council shall be placed under the control of a board or commission of experts. There is also a suggestion that it should be under the control of a Greater Sydney Council or a county council.

Barrow-in-Furness.—A Ministry of Transport inquiry was held on January 25th relative to the application of the Town Council for wayleaves for the erection of a l.p. transmission line to cross land at Finsthwaite, in order to give a supply of electricity to that parish.

Bath.—LOAN SANCTIONED.—Sanction to borrow £20,000 is sought by the Electricity Committee to cover the cost of the provision of future mains and services.

Belgian Congo.—ELECTRIFICATION.—In connection with the new hydro-electric power station at Madinghusa, Belgian Congo, of the Société Générale des Forces Hydrauliques du Katanga, the Ateliers de Constructions Electriques de Charleroi have recently completed six 4,000-kVA 6,600/115,000-V oil-cooled transformers.

Belstone.—INQUIRY.—Colonel Gordon Tucker held an inquiry on January 30th into the application of the West Devon Electricity Supply Co. for permission to erect overhead lines in the vicinity of Belstone. It was stated that the Okehampton Rural District Council raised no objection, but the Devon County Council opposed on the ground of amenity.

Binbrook.—NEGOTIATIONS FOR SUPPLY.—Negotiations are taking place with Grimsby Electricity Department with regard to an electricity supply in the near future.

Birkenhead.—LOANS.—Application is to be made by the Electricity Committee for sanction to borrow £40,000 for the following purposes: unspecified mains and services, £30,000; installations under the assisted wiring scheme, £10,000.

Braunton (Devon).—SUPPLY TO SAUNTON.—The Braunton Electric Light Co. is to extend its supply of electricity to Saunton by means of overhead lines.

Bridlington.—SCARBOROUGH LENDS STREET LIGHTING EQUIPMENT.—With regard to a suggestion which has been made that the Town Council might borrow the decorative street lighting equipment used at Scarborough, the Scarborough Town Council has decided that if such a request were made it would be willing to lend the equipment, on condition that it was transported, erected and dismantled by the staff of the Scarborough Electricity Department, at Bridlington's expense.

Brighton.—LOAN.—The Electricity Committee recommends that application be made for a loan of £7,900 with a view to improving the d.c. supply.

Burnley.—EXTENSIONS.—The Electricity Committee has considered a request to supply electricity to Cliviger, Worsthorne and Habergham Eaves. A special committee has been authorised to negotiate with the Burnley Rural District Council to supply electricity to all townships in their area.

Canada.—HYDRO-ELECTRIC PROGRESS IN 1933.—According to the bulletin issued by the Department of the Interior on January 1st, an increase of 270,210 h.p. in Canada's hydro-electric power industry last year resulted largely from the completion of the Masson development of the Maclaren-Quebec Power Company on the Lièvre River in Quebec and the bringing into operation of the initial installation of the Abitibi Canyon development in Northern Ontario by the Hydro-Electric Power Commission. Other smaller installations were completed in British Columbia. Ownership of the Canyon development on the lower Abitibi River was acquired by the Ontario Government early in the year, and the completion of the undertaking and its operation were placed in the hands of the Hydro-Electric Power Commission. The installation will comprise, ultimately, five units of 66,000 h.p. power each. Two of these are now complete and in operation, the first being placed on load in May, 1933, and the second in August. A 132,000-V transmission line, 246 miles in length, carries power from the Canyon to the Sudbury mining district, and recently the Commission completed an agreement with the Canada Northern Power Corporation under which the Corporation agrees to purchase from the Commission for a period of ten years all the additional power it requires to supply the growth in load from its various properties. Power from the Canyon, therefore, will be an important factor in the further development of mining in Northern Ontario. The Masson power development, owned by the Maclaren-Quebec Power Company, is situated at the mouth of the Lièvre River, and consists of a dam and intake 1,050 ft. long, a tunnel 6,060 ft. long and a power house and switching station. The installation consists of four 34,000-h.p. turbines operating under an effective head of 185 ft. Construction was commenced about the middle of February, 1931, and was brought to completion towards the latter part of 1933. The Beauharnois Light, Heat & Power Co. recently placed contracts for the balance of the installation to complete its full 500,000-h.p. development.

Chelmsford.—TRANSFER OF UNDERTAKING.—A letter has been received by the Electricity Committee from the County of London Electric Supply Co. conveying a notification that the company is applying to the Electricity Commissioners for approval to an arrangement by which it will manage the undertaking of the Electric Supply Corporation, Ltd., authorised by the Chelmsford Electric Lighting Order, 1894, and the Chelmsford R.D.C. Electric Lighting Order, 1898. The Committee recommends that the Council raise no objection to the application so long as its right to purchase the undertaking of the Electric Supply Corporation be not prejudiced in any way.

Dewsbury.—LOAN.—The Electricity Committee has obtained sanction to borrow £20,000 for mains and services.

Douglas (I.o.M.).—EXTENSIONS.—An application for a loan of £8,900 for the extension of mains and services and the purchase of meters and cookers is to be made. It is also proposed to run a main to Union Mills at a cost of about £1,000, Mr. Bertram Kelly, the borough electrical engineer, informs us.

Eastbourne.—FIRE-BRIGADE SWITCHES FOR NEON SIGNS.—At a meeting of the Watch Committee, the chief officer of the fire brigade called attention to the danger to firemen and members of the police force under certain conditions when they are working in close proximity to neon signs and asked that in all cases where these signs were to be fitted the plans be submitted to the fire brigade for approval of the position of the fire-brigade switch and, further, that no signs be installed without a fire-brigade switch. The Committee decided that, subject to the town clerk being satisfied as to the legal position, this be agreed to, and the town clerk was asked to communicate with the owners of all existing neon signs asking them to have fire-brigade switches fitted.

LOAN FOR EXTENSIONS.—The Electricity Committee has obtained sanction to a loan of £1,534 for overhead electric lines in connection with the supply of electricity to Willingdon and Wannock.

Elland.—CHANGE-OVER.—The Urban District Council has decided to proceed with the change-over in portions of the West Ward, and a loan of £4,072 has been applied for to cover the cost.

France.—CENTRALISATION OF POWER GENERATION.—The Société d'Electricité et Gaz du Nord is at present carrying through an important scheme of centralising its power-production facilities in larger units, so enabling it to shut down a number of small plants. The old central station in Lille has recently been closed down, the town now being supplied from the Lomme power station. The plant at Hirson has also been closed, the whole of the Fourmies-Hirson area

Municipal Electricity Supply Undertakings' Results, 1932-33

District.	Engineer.	Total Revenue.		Working Expenditure.		Net Profit.		Sales of Electricity.	
		1931/32.	1932/33.	1931/32.	1932/33.	1931/32.	1932/33.	1931/32.	1932/33.
		£	£	£	£	£	£	kWh.	kWh.
Aylesbury	W. A. Turnbull	68,180	75,522	32,604	32,866	8,504	3,678	8,687,232	9,991,974
Ayrshire	W. C. Bexon	277,574	287,496	113,189	126,084	2,544	6,023	45,273,246	48,078,775
Bedford	R. W. L. Phillips	158,962	162,916	95,663	99,693	5,115	3,351	45,585,930	47,978,223
Buxton	A. Bishop	24,471	25,796	13,734	14,044	—	3,892	2,083,919	2,323,147
Epsom	H. W. Watts	51,634	47,112	26,141	30,235	5,270	3,390	4,400,796	4,961,970
Gillingham	H. Hall	64,296	69,679	40,722	47,508	13,290	12,443	9,726,003	12,499,285
Gravesend	C. F. McInnes	82,886	94,222	41,695	46,204	6,812	11,478	18,355,728	24,955,094
Hove	F. Swarbrick	18,135	19,323	11,806	12,561	2,979	3,249	2,930,000	3,331,000
Newton-in-Makerfield ...	W. Phoenix	20,332	22,435	14,676	15,662	1,981	2,744	3,241,121	3,630,038
Taunton	A. J. Howard	37,942	41,240	32,987	39,237	4,953	1,903	4,384,245	5,202,754
Wimbledon	A. E. McKenzie	225,201	227,877	121,041	113,811	22,494	31,387	33,329,843	37,219,138

being now supplied from the generating station at Maubeuge, which, following the completion of a 45,000-V transmission line, will also take over the supply to Jeumont.

Glasgow.—MAINS EXTENSIONS.—The Corporation is to extend mains at a cost of £12,525.

Grays.—REDUCED CHARGES.—The Urban District Council has decided, under the two-part scale, that where premises are let in separate tenancies a minimum charge of 7s. 6d. per quarter shall be made to each tenant, but if part of the premises is sublet this charge may be reduced, at the discretion of the electrical engineer, the minimum being 2s. 6d. per quarter.

Guildford.—OVERHEAD LINES.—The Rural District Council has decided to raise no objection to the use of overhead lines at Ash Vale and Mytchett by the Mid-Southern Utility Co., but has requested the Surrey County Council to object to overhead lines along Wood Lane, Seale, on the ground that there is insufficient room for the erection of poles.

COMPTON FRINGE ORDER.—The Electricity Committee has consented to the granting of a Fringe Order to the Mid-Southern Utility Co. to enable it to supply electricity to Compton.

LOAN.—The Electricity Committee is applying for sanction to a loan of £10,000 for mains.

Ilford.—SUPPLY IMPROVEMENTS.—The Electricity Committee is to improve the supply in the Redbridge district at a cost of £1,521.

Irish Free State.—THE SHANNON SCHEME.—The text of the Electricity Supply Amendment Bill was issued on February 1st, under which the Minister for Industry and Commerce is asking for authority to advance a further £1,160,000 for the development of the Shannon scheme. The total advances for development provided up to the present amount to £3,360,000. The total indebtedness of the scheme up to March, 1933, was nearly £10,000,000. The whole sum now asked for may not be expended for some years. Work in connection with the scheme at Lough Allen and Lough Derg will, it is expected, be proceeded with during the ensuing summer.

Italy.—HYDRO-ELECTRIC SCHEME.—The Società Idroelettrica di Val Maremola, in the Savona province, is about to begin the works on the high Maremola Valley for using the waters for irrigation and for the production of electrical energy.

Lanark.—ELECTRICITY FOR COUNCIL HOUSES.—The County Council Housing Committee has decided to install electrical fittings in its 122 houses at Coalburn, in the event of the Clyde Valley Electrical Power Co. introducing electricity in the district.

Littleborough.—LOAN.—The Council is applying for a loan of £1,606 for an electricity extension scheme at Shore Mill.

Maidenhead.—MAINS EXTENSIONS.—The Town Council is to extend its mains to Braywood and Oakley Green for a distance of 1¼ miles, which will carry the supply to within reach of the south-eastern boundary of the statutory area. The distributing mains will cost about £790.

Maidstone.—MAINS EXTENSIONS.—The Town Council has applied for sanction to borrow £20,000 for mains extensions.

Manchester.—LOANS.—The City Council had before it on February 7th three proposals to borrow large sums of money for electricity works: (1) service mains, £100,000; (2) boilers and cooling towers at the Stuart Street power station, £95,000; (3) high-voltage transmission system, £87,200.

EXTENSIONS.—The Electricity Committee is to provide electricity supply to tenements at Smedley Point, and install electricity at the housewifery centre at Hulme.

Manchukuo.—NEW POWER STATION.—A large new electric power station is being built at Darien by the South Manchurian Electric Co. in conjunction with a new chemical works for the Manchurian Chemical Industry Co. The contract for the first 25,000-kW turbo-generator set for the new station has been secured by the Brown-Boveri Co. The turbine is of the three-cylinder type and is being designed to run at 3,000 r.p.m. and operate with steam at a pressure of 34 atmospheres and at a temperature of about 800 deg. F.

Mevagissey.—LOCAL INQUIRY.—The Electricity Commissioners have decided to refuse the application by the St. Austell and District Electric Lighting and Power Co., Ltd., for a Special Order covering Mevagissey. The Commissioners are still of opinion that the best solution would be for the St. Austell Company to endeavour to acquire the Mevagissey undertaking.

Middlesex.—METERS AND INSTRUMENTS.—The County Council has authorised the expenditure of approximately £3,455 for the purchase of meters and testing instruments required by the engineering services at its Public Assistance hospitals and institutions, including the cost of instruments for the county architect.

Nairn.—SUPPLY SOON.—A commencement has now been made with the laying of cables for the introduction of electric lighting into Nairn. The contract has been placed in the hands of Messrs. Balfour, Beatty & Co., and the High Street is to be lighted with 300-W lamps.

Norman Cross.—MAINS EXTENSIONS.—The Beds, Cambs and Hunts Electricity Co. has informed the Rural District Council that it proposes to extend mains from Norman Cross to Stilton.

Northallerton.—EXTENSIONS.—Subject to the cost being reasonable, the Rural District Council has decided to support an application by the Stokesley Rural District Council to the Electricity Commissioners with respect to the supply of electricity in certain villages to the south of Stokesley, the North-Eastern Electric Supply Co., Ltd., having declined to link up these places on the ground of expense.

Northern Ireland.—BELFAST.—The Electricity Committee has agreed to contribute £11,000 to the relief of the consolidated city rate from the profits on the working of the undertaking for the year ending March 31st, 1935. The contribution is granted to ease the exceptional burden of distress relief, and is in no way to be taken as forming a precedent.

Penybont (Denbighshire).—ELECTRICITY CHARGES.—The Rural District Council has decided to make a minimum charge of 30s. per year for electricity consumers in Kenfig Hill, Cefn Cribbwr, Cornelly and Maudlam.

Plymouth.—ELECTRICITY REPLACES GAS.—The Hospital Committee is to replace gas appliances at the mental hospital by electrical equipment at a cost of £803.

MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £1,900.

Rugby.—NEW EQUIPMENT.—The Town Council has decided to provide a 4,000-kVA transformer, a sub-station with equipment and cables at an estimated cost of £6,492, to be defrayed out of revenue, subject to the consent of the Electricity Commissioners.

A sub-station of pleasing design erected by the Hoylake undertaking at Coldy Village

Salford.—LOAN.—The Electricity Committee is applying for sanction to a loan of £15,000 for sub-stations on consumers' premises and transformer pits and switch pillars.

Sheffield.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £3,740.

Shipley.—STREET LIGHTING.—The Electricity Committee has decided to install gaseous-discharge lamps for street lighting.

South Africa.—PRETORIA.—The Pretoria municipal accounts for the year ended June 30th last show that the Electricity Supply Department made a profit of £28,223. The total income was £205,796, and the expenditure was £177,572. During the year 38,863,908 kWh was sold at an average price of 1.097d. per kWh.

Southall.—SUB-STATION.—The Metropolitan Electric Supply Co., Ltd., is to erect a sub-station in Scotts Road, Southall.

Southport.—IMPROVED LIGHTING.—The Electricity Committee has authorised the electrical engineer to carry out experiments in connection with the improvements of the street lighting in Lord Street and the Promenade.

Sunderland.—AN ELECTRICAL STOKER.—The Electricity Committee proposes purchasing an improved electrical stoker for use at the generating works, to cost £12,000.

Switzerland.—DECLINE IN OUTPUT.—At the annual meeting of the Waggital Power Works Co. it was stated that the sales during 1932-33 had only amounted to 107 million kWh as compared with 142 million kWh during the preceding twelve months. The Lontschwerk Co. also reports a fall in the sales of power of 42 per cent.

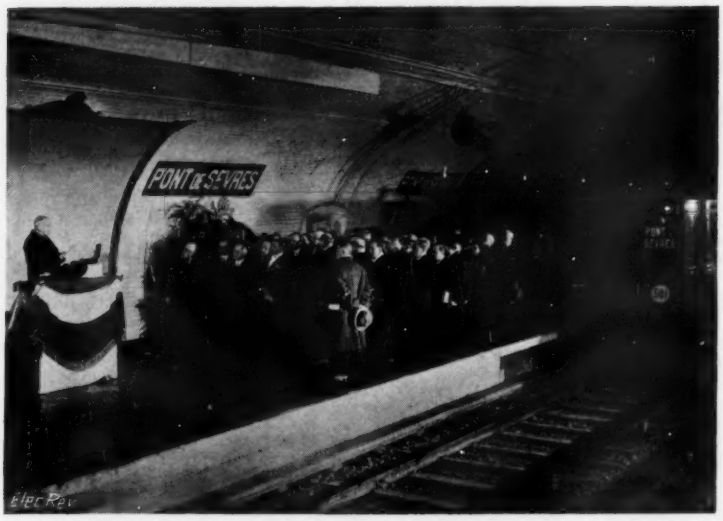
Tenterden.—RURAL SUPPLY.—The Ashford Urban District Council has informed the Rural District Council, with reference to the supply of electricity to outlying villages, that the only way assistance could be given would be by furnishing a supply in bulk to the Weald Electricity Supply Co. The latter has informed the Council that the question of a bulk supply from Ashford has been before the directors for a long time. Canvassing for consumers in the Appledore and Woodchurch districts is being continued.

Wooburn.—REDUCED CHARGES.—The Cookham Electricity Co. has reduced the flat rate for electricity from 9½d. to 8d. per kWh.

York.—LOAN.—The Electricity Committee recommends that an application be made for a loan of £15,255 in order to make alterations at various sub-stations.

Traction

France.—PARIS MÉTRO.—We illustrate below the opening of the first section of the suburban extension of the Paris Métropolitan Railway by the Minister of Public Works, which took place on February 3rd. This section consists of an extension of line No. 9, running from the Porte de Saint Cloud to the Pont de Sèvres with an intermediate station at Boulogne-sur-Seine. The new section is being used for ordinary traffic straight away.



The opening of the new Paris Métro line by M. Paganon, the French Minister of Public Works

India.—DIESEL-ELECTRIC CARS FOR RAILWAYS.—The Indian Standard Finance Committee for Railways has approved a proposal to introduce Diesel-electric rail-cars on the Madras and Southern Mahratta Railway. These are intended to meet the competition of motor omnibuses, and will replace short-distance steam trains. Six are to be purchased initially at a cost of about £26,000, with about £2,000 more for a spare motor and engine. It is estimated that the cost will be recouped in five years owing to the saving in working expenses.

London.—TUBE WANTED IN S.E. AREA.—Delegates from twelve Chambers of Commerce attended a meeting at Peckham last night to ask for the Underground system to be extended to South-East London. The extension of the Bakerloo Railway from Elephant and Castle to Camberwell Green at a cost of two million pounds was approved by Parliament in 1931, but the London Passenger Transport Board stated a few months ago that it did not intend to proceed with the proposal.

Portsmouth.—TRANSPORT LOSSES.—The Finance Committee is faced with the difficulty of providing for an estimated deficiency of £31,168 on the transport undertaking, and has therefore urged the Council to investigate the financial position of the undertaking.

South Shields.—TRACK RECONSTRUCTION.—The Tramways Committee has approved proposals for the extension of the tramway route from King George Road to the borough boundary at a cost of £4,800 and for the reconstruction of the Ocean Road tramway route at £5,000.

Sunderland.—NEW TRAM.—The Transport Committee has decided to order a new English Electric tramcar at a cost of £2,891. The car will be a double-decker of a new type similar to the single-deck car now in operation at Blackpool. It will be 38 ft. long, and much larger than any other car at present in service. The ends of the car will be of a modified streamline design, the driver will have a special cabin of his own, and the car will run on equal wheel bogie trucks. This is said to be the first double-decker of its type to be built in this country.

Communications

Birmingham.—TELEPHONE DEVELOPMENT.—The annual progress report of the local P., T. & T. Advisory Committee (superintending engineer, Mr. R. A. Weaver) shows that in 1933 the number of telephones increased by 2,740 to 86,383, a better result than in the previous year. Public call offices now number 1,255, of which 915 are street kiosks. The number of calls increased by 3,400,000 during the year to 66,700,000, including 4,930,000 trunk calls. Private branch exchanges increased by 137 to 4,164, to which 32,541 instruments are connected. Residential instruments increased by 970 to 19,434. Nine auto-exchanges were opened, 54 per cent. of the subscribers in the Birmingham district now being served automatically, which is an increase of 14 per cent. during the year. Of the long-distance calls originated in the district, 95 per cent. are now completed "on demand." The underground wire mileage is 446,016, only 20,906 miles being overhead.

TELEGRAPHY.—The telegraph service has been remodelled; the Morse and Bandot systems have been abandoned and ninety teleprinter circuits established instead. In June, 1933, telegraph traffic began to increase and there was a marked improvement for the rest of the year, during which 90 million transactions were dealt with. Subscribers' telegrams dealt with by telephone increased by 15,000 to 913,000.

China.—NEW BEAM WIRELESS STATION.—The new beam wireless station at Chenju was opened on February 3rd. The station provides the first direct wireless connection with Great Britain for commercial purposes.

Great Britain.—TELEPHONE SERVICE TO SHANGHAI.—Imperial & International Communications, Ltd., announce that a direct wireless service between London and Shanghai was opened to the public on February 3rd. The routing instructions for this service will be "*via* Imperial Wireless" and the rates the same as for the cable routes.

RADIO RELAY SERVICES.—The Oldham Town Council has decided not to grant facilities for the establishment of relay services in the town.

The Cheltenham Highways Committee has refused to grant an application by the Universal Wireless Relay Service for permission to establish a relay service in the town.

Broadcast Relay Services have withdrawn their application for permission to establish a relay service at Linthwaite.

The Watford Corporation has submitted a draft agreement to Watford Wireless Relay, Ltd.

Mr. R. Miller, proprietor of West Wales Relay Service, Haverfordwest, has received sanction from Neyland U.D.C. to establish a service in the town.

India.—NEW TELEPHONE PROPOSALS.—The postal authorities in India are now considering a number of proposals for the consolidation and further development of telephony in the country, reports our Bombay correspondent. The line to Madras which is already working satisfactorily may be duplicated. Similarly, the line between Bombay and Calcutta may be quadrupled to meet the great increase in traffic. There is also demand for alternative routes between Delhi and Bombay, and Bombay and Madras. These can be had by connecting Jhansi with Bhusaval, and Nasirabad with Ahemedabad and Hyderabad (Sind). After this programme is completed attention will be directed to the construction of a direct line between Calcutta and Madras. When this is done the whole of India will have been covered with a network of telephones. The link with Ceylon will be effected before March next.

BROADCASTING.—It has now been decided to introduce a scheme of broadcasting in the N.-W. Frontier Province, which will be confined at the outset to ten selected villages in the Peshawar district, and if the experiment is successful the Government hope to introduce a network of transmitting stations that will serve villagers throughout the province. It is understood that this broadcasting will be used for instruction of the villagers through short talks on seed, crops and cattle, market prices, village sanitation, malaria and other epidemics, notices of forthcoming events, fairs and floods. It is stated that the British Broadcasting Company has offered to lend a transmitter costing £2,000.

Leeds.—TELEPHONE DEVELOPMENT.—In the West Yorkshire area (superintending engineer: Mr. C. A. Taylor) 2,547 new telephones were added in 1933, raising the total to 77,056. Residence rate subscribers increased by 950 to 16,052, and in the automatic area within five miles of Leeds only 4 per cent. of the subscribers remain connected to manual exchanges. Keighley and Halifax automatic areas were similarly extended, and the number of rural auto-exchanges was increased to twelve, besides seventy-five new street kiosks, of which there are now 888. Trunk calls increased to 6,982,000 and junction and local calls to 51,495,500.

North Wales.—TELEPHONE PROGRESS.—In the Chester, North Wales, and Hanley district there are 381 telephone exchanges, an increase of seven, of which 112 are automatic. The number of local calls made in 1933 reached 22,893,601, and the trunk calls numbered 4,635,686. Telephones increased by 2,330 to 49,761, exchange lines by 1,282 to 33,889, and call offices by seventy-nine to 1,667, including 467 kiosks, eighty-three more than in the previous year. Residential telephones increased by 746 to 10,491, or 21. 1 per cent. of the total in the distirct. Private branch exchanges increased by twenty-seven to 234. In the Chester area alone there are ninety-three rural automatic exchanges. In this as in other districts telegraph traffic is definitely increasing.

Northern Ireland.—TELEPHONE DEVELOPMENT.—The official report of the Northern Ireland telephone authorities for 1933 states that the number of telephone exchanges now operating is 154. During the past year 5,566 new stations have been added to the system; accounting for those which were closed down, the net increase for the year is 1,025. Almost one million more calls were recorded than in 1932, showing an increase of 4.7 per cent.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Argentina.—BUENOS AIRES.—February 21st. State Oilfields. Six three-phase, oil immersed, outdoor-type transformers. (A.Y. 12193.)*

Australia.—MELBOURNE.—Post and Telegraph Department. March 13th. Various insulated wires. (A.Y. 12172.)*
March 20th. Telephone protective apparatus of various types. (A.Y. 12186.)*
Bell sets and portable telephones. (A.Y. 12169.)*
March 27th. 150-600 miles of twin 0.048 in. rubber-insulated, braided telephone wire. (A.Y. 12194.)*
City Council. March 12th. Totally enclosed metal-clad switchgear. (A.Y. 12170.)*
March 26th. Supply of three-phase, 6,600-V, metal-clad switchgear, suitable for rupturing 250,000 kVA. (A.Y. 12185.)*
February 26th. City Council Electricity Department. Oscillograph equipment consisting of three vibrators, together with optical viewing and recording accessories. (A.Y. 12191.)*
BRISBANE.—City Council. March 2nd. Two 11,000-V 3-phase metal-clad switchboards. (A.Y. 12184.)*
SYDNEY.—February 28th. New South Wales Department of Railways. One 500-kW rectifier unit. (A.Y. 12182.)* Remote control equipment for a rotary convertor and five enclosing d.c. feeder equipments. (A.Y. 12183.)*
PERTH.—April 19th. Western Australian Government Electricity Supply. Boiler house equipment, one 25,000-kW turbo-alternator and e.h.p. and l.p. switchgear. (February 2nd.)

Aylesbury.—February 21st. Electricity Department. Materials for twelve months from April 1st, 1934. (See this issue.)

Bedford.—February 12th. Electricity Department. E.h.p., h.p., and l.p. cables, and electric lamps for the year ending March 31st, 1935. (January 26th.)

Belgium.—BRUSSELS.—February 23rd. Municipality. Supply and installation of a 20,000-kW steam turbo-generator. Particulars and plant (125 fr.) from 11, Rue Ste. Catherine.
IXELLES (BRUSSELS).—February 22nd. Supply of 270 d.c. electricity meters. Particulars from Service de l'Electricité, 20, Rue Alsace-Lorraine.
ANTWERP.—March 13th. Supply and installation of a mercury vapour rectifier on the Quai Cockerill. Particulars (5 fr.).

Bexley.—February 27th. U.D.C. Transformers, two on-load tap-changing equipments and switchgear kiosks. (See this issue.)

Blackburn.—February 26th. Electricity Committee. Cable, rubber-insulated wire and consumers' meters for twelve months. (January 19th.)

Cheadle & Gatley.—February 9th. Electricity Department. Various materials during the year ending March 31st, 1935. (January 26th.)
February 12th. One 6,600-V truck cubicle and metering equipment. (January 26th.)

Cleethorpes.—March 6th. Urban District Council. Transformers, switchgear and mains stores. (See this issue.)

Dundee.—February 14th. Corporation. Various works, including electric lighting installation at Hawkhill housing scheme. Particulars from City Quantity Surveyor, 91, Commercial Street; tenders to Town Clerk.

Eastbourne.—February 12th. Electricity Department. E.h.p., h.p., and l.p. cables for twelve months from March 1st next. (February 2nd.)
February 19th. 500 electric cookers. (See this issue.)

Egypt.—ALEXANDRIA.—February 26th. Ministry of Communications. Cable, switchgear, transformers, hauling winches and motors. (A.Y. 12094.)*
February 25th. Ramleh Electric Railway. Two three-phase 6,300-V 50-cycle alternators. (A.Y. 12207.)*

Farnworth.—February 14th. Electricity Department. L.p. distribution pillar. (See this issue.)

Fort William.—February 12th. Town Council. Various works, including electrical, at housing scheme. Specifications, &c., from A. Forrester, Burgh Surveyor. Offers to Town Clerk.

Glasgow.—February 15th. Corporation. Repairs to the steam rotors, wheels, and blading of turbines at refuse power works. Specifications, &c., from Director of Cleansing, 20, Trongate; tenders to Town Clerk.

Harrogate.—February 24th. Electricity Department. Stores for twelve months commencing April 1st, 1934. (January 26th.)

Hastings.—February 20th. Electricity Department. Various materials for the year ending March 31st, 1935. (January 26th.)
February 27th. Electricity Department. Switchgear, cable tiles, concrete covers, copper wire, &c., for twelve months ending March 31st, 1935. (February 2nd.)

Hull.—March 27th. Telephone Committee. Automatic telephone exchange. (See this issue.)

India.—SIMLA.—February 22nd. Director of Contracts, Army Headquarters. Eighteen electric motors, 1½ to 50 h.p. (January 26th.)
TRAVANCORE.—May 7th. Government Electricity Department. Turbines, generators, switchgear, transformers, &c., for the Pallivasol hydro-electric scheme. (See this issue.)

Kettering.—February 26th. Electricity Department. E.h.p. and l.p. underground cables for the year ending March 31st, 1935. (See this issue.)

Kinsardine-on-Forth.—February 19th. Bridge Joint Committee. Various works, including electric lighting, in thirty houses. Specifications from J. Fraser & Son, 3, Randolph Street, Dunfermline; tenders to J. M. Mitchell, County Clerk, County Buildings, Cupar.

London.—HAMMERSMITH.—February 28th. General electrical stores, &c., for twelve months. (January 19th.)
STOKE NEWINGTON.—February 23rd. Electricity Department. Meters and l.p. cable (annual contract). (February 2nd.)

Manchester.—February 23rd. Electricity Committee. Two complete water-tube boiler units and 33-kV and 6.6-kV switchgear. (February 2nd.)
February 23rd. Corporation. 33-kV switchgear, two 25,000-kVA, one 6,000-kVA and two 5,000-kVA transformers for various sub-stations. (See this issue.)
February 28th. Cooling towers for Stuart Street power station. (See this issue.)

Milford.—February 28th. Electricity Department. Materials for twelve months ending March 31st, 1935. (See this issue.)

New Zealand.—WELLINGTON.—Posts and Telegraph Department. February 19th. 1,000 ebonite or bakelite telephone earpieces. (A.Y. 12133.)* Inset transmitters, bakelite mouthpieces and microtelephone plungers for automatic table telephones. (A.Y. 12131.)*
March 13th. 3,000 four-conductor telephone cords. (A.Y. 12149.)*
March 14th. Telephone instrument cords. (A.Y. 12177.)* 2,640 ft. of v.i.r. telephone cable. (A.Y. 12178.)*
March 15th. Twenty-six 2-V 130Ah cells. (A.Y. 12152.)*
March 27th. Public Works Tenders Board. One set each of 110-kV and 33-kV outdoor switching equipment and steelwork for these. (A.Y. 12180.)*
Public Works Department. April 24th. Four mimic bus panels to control four 110-kV oil circuit-breakers. (A.Y. 12176.)*

Northern Ireland.—BELFAST.—March 5th. Electricity Board. 33-kV and 11-kV overhead transmission lines, new l.p. distribution systems, and reconstruction of existing l.p. systems. (January 26th.)

Runwell (ESSEX).—February 28th. East Ham and Southend-on-Sea Joint Visiting Committee. Electrical installation at Mental Hospital. (December 22nd.)

Salford.—February 10th. Electricity Department. Stores, including electric kettles, fires, water heaters, wash boilers, &c. (January 26th.)
February 21st. Electrical stores. (February 2nd.)
February 21st. Cable tiles and cable covers. (See this issue.)

Sheffield.—February 12th. Corporation. Maintenance of private telephone and bell installation at hospitals from April 1st. Particulars from Clerk & Steward, Lodge Moor Hospital.

South Africa.—PRETORIA.—March 2nd. City Council. Turbo-alternator, condensing plant and auxiliaries, boilers and electrically operated crane. (December 22nd.)
February 16th. Government Supplies Board. Telephone switchboards for private branch exchanges. (A.Y. 12165.)* Underground armoured cables, covered wire, copper wire, &c. (A.Y. 12166.)* Six level measuring sets and six audio-frequency oscillators. (A.Y. 12168.)*
JOHANNESBURG.—Railways and Harbours. February 26th. Fog-signalling plant consisting of a Diesel-engine driven d.c. generator, a d.c. motor driven 150-cycle, a.c. generator, and an atmospheric acoustic emitter with accessories. (A.Y. 12174.)*
February 19th. Two-ton electrically driven overhead travelling crane. (A.Y. 12181.)*
CAPETOWN.—February 21st. Electricity Supply Commission. Eighteen oil-immersed transformers for outdoor use. (A.Y. 12192.)*

Stoke-on-Trent.—March 12th. N.W. Midlands J.E.A. Transformers, e.h.p. and l.p. overhead transmission lines. (See this issue.)

Swansea.—February 16th. Stores for twelve months from April 1st, 1934. (January 26th.)

Uruguay.—MONTEVIDEO.—March 21st. State Electricity Supply and Telephones Administration. H.p. and l.p. and telephone armoured cables. (A.Y. 12189.)*

Worcester.—February 17th. Electricity Department. Meters, cables, transformers. &c., for twelve months ending March 31st, 1935. (February 2nd.)

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bridlington.—Town Council. Accepted. Overhead catenary cable to Flamborough (£685).—Watshams, Ltd.

Dundee.—Education Committee. Accepted. Electric lighting installation (£190).—Stenson & Co.

Durham.—County Education Committee. Accepted. Electric lighting in the Spennymoor Ross Street Council School (£130). —R. Robson.

Glasgow.—Housing Committee. Accepted. Electrical installation at Copland Road housing scheme (£398).—J. Edward.
Health Committee. Accepted. Refrigerators at City Hospitals (£504).—J. & E. Hall, Ltd.
Education Committee. Accepted. Electrical work at St. Peter's Boys' School (£391).
Corporation. Automatic traffic signals in Great Western Road (£2,815).—Automatic Electric Co., Ltd.
Municipal Transport Committee. Accepted. Copper trolley wire.—R. Johnson & Nephew, Ltd.; I.C.I. Metals, Ltd.

Cleaning Committee. Electric battery for the Govan works, with allowance for the old material (£187).—Tudor Accumulator Co., Ltd.

Liverpool.—Electric Power and Lighting Committee. Recommended. Harrington Street sub-station: two 2,500-kVA transformers, with tap-changing gear (£7,966).—Ferranti, Ltd. H.p. switchgear (£5,895).—Ferguson, Pailin, Ltd.

Maidenhead.—Town Council. Accepted. Transformer kiosk, with switchgear (£223).—W. Lucy & Co., Ltd.

Newcastle-on-Tyne.—City Council. Accepted. Rewiring of the General Hospital (£110).—Fletcher Bros.

Northern Ireland.—BELFAST.—County Borough. Accepted. Wiring and connecting up existing electrical plant at refuse destructor works (£235).—A. W. Hamilton & Co.
Police Committee. Recommended. Vehicle-actuated traffic control equipment (£2,082).—Automatic Electric Co., Ltd.

Plymouth.—Hospitals Committee. Accepted. Motor and starter equipment for Mental Hospital laundry (£72).—Electric Construction Co., Ltd.

Salford.—Electricity Committee. Recommended. Eight-circuit switchboard (£116), nine-circuit switchboard (£164).—English Electric Co., Ltd.

Tipton.—Gas Committee. Accepted. Overhead electric cables to gasworks.—Invincible Electrical Engineering Co., Ltd.

Tynemouth.—Town Council. Accepted. Cable (£398).—Macintosh Cable Co., Ltd.

Winchester.—City Council. Accepted. H.p. switchboards for three sub-stations.—Ferguson, Pailin, Ltd.

Forthcoming Events

Electrical Engineers' Ball.—Friday, February 9th. Grosvenor House, W.1. 8.30 p.m.

Junior Institution of Engineers.—Friday, February 9th. Institution, London., 7.30 p.m. "Thunderstorms, Magnetic Storms and Wireless Transmission." Prof. E. V. Appleton.

Association of Mining Electrical Engineers.—(*South Wales Branch*).—Saturday, February 10th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Mercury Arc Rectifiers." Mr. H. Rissik. (*West Wales Branch*).—Saturday, February 10th. Y.M.C.A., Swansea. "Colliery Engineering." Mr. W. I. Tanner.

Salford Technical and Engineering Association.—Saturday, February 10th. Royal Technical College, Salford. 7 p.m. "Electric Arc Welding." Mr. W. E. Quine.

Institute of Transport.—Monday, February 12th. Institution of Electrical Engineers, London. 5.30 p.m. "Regeneration as Applied to Electric Traction." Mr. G. F. Sinclair. (I.E.E. Members are invited.) Friday, February 16th. Connaught Rooms, W.C.2. 6.30 for 7 p.m. Annual Dinner.

Illuminating Engineering Society.—Tuesday, February 13th. Trocadero Restaurant, W.1. 7 for 7.30 p.m. Annual dinner.

Institute of Marine Engineers.—Tuesday, February 13th. 85, The Minories, E.C.3. 6 p.m. "Turbo-Electric Propulsion." Mr. C. Wallace Saunders.

Diesel Engine Users' Association.—Wednesday, February 14th. Caxton Hall, S.W.1. 3 p.m. "Piston Design and Material." H. J. Maybrey.

Institution of Engineers-in-Charge.—Wednesday, February 14th. Institution, London. "Photocells and Their Application." Mr. R. C. Walker.

Institution of Electrical Engineers.—Thursday, February 15th. Institution, London. 6 p.m. Joint meeting with other Institutions. "The Influence of the Benson Boiler on the Development of Power Stations." Mr. F. Ohlmuller. (*Mersey and North Wales (Liverpool) Centre*).—Monday, February 12th. Central Hall, Liverpool. 7.30 p.m. Faraday Lecture. "The Electrical Engineer and the Free Electron." Mr. C. C. Paterson. (*North-Eastern Centre*).—Monday, February 12th. Armstrong College, Newcastle-on-Tyne. 7 p.m. "The Influence of the Benson Boiler on the Development of Power Stations." Mr. F. Ohlmuller. Wednesday, February 14th. Literary and Philosophical Society, Newcastle-on-Tyne. Faraday Lecture by Mr. C. C. Paterson. (*North Midland Students' Section*).—Tuesday, February 13th. Hotel Metropole, Leeds. 7.15 p.m. Students' lecture. "Domestic Electrical Apparatus from an Engineering Point of View." Mr. F. H. Clough. (*North-Western Centre*).—Tuesday, February 13th. Engineers' Club, Manchester. 7 p.m. "The Influence of the Benson Boiler on the Development of Power Stations." Mr. F. Ohlmuller. (*Scottish Centre*).—Tuesday, February 13th. North British Station Hotel, Edinburgh. 7 p.m. "The Application of Automatic Voltage and Switch Control to Electrical Distribution Systems." Messrs. W. Kidd and J. L. Carr. (*Sheffield Sub-Centre*).—Wednesday, February 14th. Royal Victoria Hotel, Sheffield. 7.30 p.m. Address by Mr. P. V. Hunter. (*Irish Centre*).—Thursday, February 15th. Trinity College, Dublin. 7.45 p.m. "Some Aspects of the Electrical Transmission of Power by means of D.C. at very High Voltages." Mr. H. Rissik. (*North Midland Centre*).—Thursday, February 15th. Albert Hall, Leeds. 7.30 p.m. Faraday Lecture by Mr. C. C. Paterson. (*North-Eastern Students' Section*).—Friday, February 16th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "Tapping the High-Tension Grid." Mr. T. D. Oswald.

Electrical Wholesalers' Federation.—Thursday, February 15th. Savoy Hotel, London. 6.30 for 7 p.m. Annual Dinner.

Institution of Chemical Engineers.—Friday, February 16th. Hotel Victoria, London. 11 a.m. Annual meeting. 7 for 7.30 p.m. Annual Dinner.

Makers' Names Wanted

CHALLENGER soldering iron.

Notes

Diesel-electric Paddle Boats

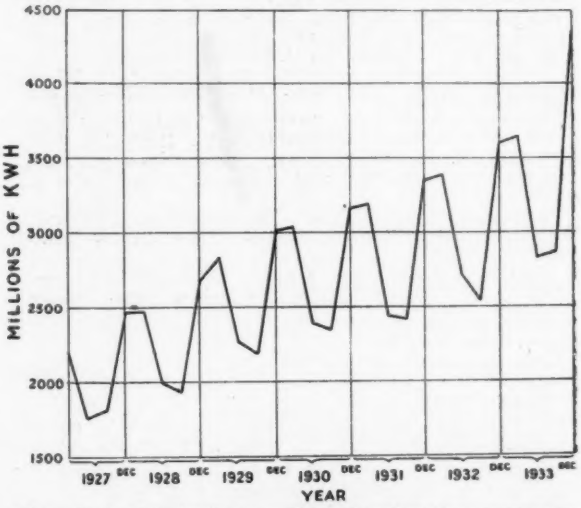
Messrs. William Denny & Bros., Leven Shipyard, Dumbarton, established a record for their yard on January 29th, when two paddle-boats were launched for service as ferry-boats on the Forth between North and South Queensferry. One of the boats, *Robert the Bruce*, is the first all-electric-welded boat built in Scotland. Both vessels are fitted with Diesel-electric machinery, the engines having been built by Messrs. Davey Paxman and the electrical equipment supplied by the Metropolitan-Vickers Electrical Co., Ltd. The boats are paddle-steamers of 217 tons gross each. An illustration of the *Robert the Bruce* appears on page 186.

Electrodepositors' Dinner

The annual dinner and dance of the Electrodepositors' Technical Society was held on February 2nd at the Comedy Restaurant, Haymarket, and during the evening a presentation of an engraved silver cigarette case and a cheque was made to Dr. S. Wernick to mark his seven years of continuous service as hon. secretary. "The Society" was proposed by Mr. S. Field, first president of the Society, who remarked that not one of the small band who founded the Society in November, 1925, could have predicted the remarkable progress which had been steadily made by the Society whose published work was of international importance. Mr. E. A. Ollard, vice-president, replied, and Mr. A. W. Hothersall and Dr. M. Cooke also spoke.

Seven Good Years

The Electricity Commissioners have published statistics of electricity generation by authorised undertakers during the past seven years, showing the output quarter by quarter. From these figures we have plotted the accompanying curve which illustrates in a striking manner the steady upward



The output of electricity by authorised undertakers, quarter by quarter, from 1927 to 1933

trend culminating in the record figure of 4,202 million kWh in the last quarter of 1933. The totals for the seven years (in millions of kWh) were as follows:—1927, 8,234; 1928, 9,073; 1929, 10,294; 1930, 10,914; 1931, 11,413; 1932, 12,241; and 1933, 13,554.

I.E.E. (London Students' Section)

The second half of the session of the I.E.E. London Students' Section opened last Saturday with a visit to the Brentwood wireless station of Imperial and International Communications, Ltd. The programme arranged by the honorary secretary, Mr. L. E. Hefferman, includes ten more visits and seven meetings, in addition to the annual dinner (always a pleasantly informal affair), and the summer outing, when the electrified section of the Southern Railway will be viewed. There will also be a joint sports meeting with the London Student and Graduate Sections of the Institutions of Civil and Mechanical Engineers. Mr. H. T. Young, the I.E.E. Council's representative on the Students' Committee, has presented a trophy to be competed for annually, on a triangular tournament basis, by the students and graduates of the three premier engineering Institutions. The events of this year will be confined to cricket and tennis, but some other form of sport may be introduced later on. Any member wishing to be considered for a place in the teams should communicate with Mr. T. G. Martin, 239, Western Avenue, London, W.3. The visits are arranged by Mr. N. R. Rice, 32, Elsie Road, Dulwich, S.E.22.

Appointments Vacant

Junior charge engineer for Barrow-in-Furness Electricity Department.

Consumers' engineer and meter and installation assistant for Basingstoke Electricity Department.

Borough electrical engineer for Hackney Borough Council.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Viscount Hinchingbrooke has been elected to the board of the Anglo-Portuguese Telephone Co., Ltd.

Dr. W. J. Turrell, physician-in-charge of the electrotherapeutic department of the Radcliffe Infirmary, Oxford, has, according to the *Times*, received from Dr. N. E. Titus, of New York, the gold key awarded to him at the last annual meeting of the American Congress of Physical Therapy. This distinction is the highest awarded in the United States for original research and distinguished services in the field of electrotherapy.

Mr. M. D. Cloran, M.C., has been elected president of Faraday House Old Students' Association for the ensuing year. The vice-presidents are Major G. A. B. Leisham, M.C., and Mr. L. H. Short, M.C., and the members of the Council Messrs. A. L. Cramb, C. Kibblewhite, and W. G. Radley.

Mr. J. Auty, for thirty-nine years mains foreman at the Dewsbury Corporation electricity works, has retired, and he has been presented by the staff and employés with a silver watch and a walking stick.

Mr. G. W. Molle has joined Ferro Concrete & Electrical Construction, Ltd., as sales manager. He is retaining his interest in Messrs. A. H. Seabrook & Partners, consulting engineers.

Mr. H. R. Warminger is just retiring after forty-eight years' service with the Pritchett & Gold & E.P.S. Co., Ltd. He started work in 1886 with the old Electrical Power Storage Co. at Millwall, at the age of eighteen years, as an assistant wireman on outside jobs. A year or two later he went into the works and was employed on various assembly jobs, particularly on "running-up" groups, the method then employed. On outside jobs he helped in the erection of the first battery at the Royal Mint and those of the Lyric Theatre and other well-known places in London. When the E.P.S. was amalgamated with Pritchett & Gold in 1916 he was transferred to the works at Dagenham, and he has been at work there ever since as a burner and "runner-up."

Mr. H. R. Warminger

Margaret Lady Moir, who will complete her three years of office as president of the Electrical Association for Women in April next, is to mark the occasion by presenting to the Association at a meeting on Tuesday next a portrait of **Miss C. Haslett,** the director, by Miss Dorothy Vicaji. Following the presentation, **Mr. A. P. M. Fleming,** M.Sc., M.I.E.E., director of the Metropolitan-Vickers Electrical Co., Ltd., is to give a lecture to a joint meeting of the Women's Engineering Society and the E.A.W. Demonstrator's Circle, his subject being "General Industrial Conditions in Russia."

Mr. W. G. Hendrey

Mr. W. Græme Hendrey, M.I.E.E., overseas manager of Callender's Cable & Construction Co., Ltd., has been appointed an advisory director of the company. Mr. Hendrey joined the company in 1903, and went to India in 1908, being appointed manager of the Calcutta office two years later. He returned to London in 1921, and was given charge of the company's colonial and overseas business. He is a director of the Wad Medani Electric Supply Co., an alternate director of the Sudan Light & Power Co., and secretary of the India Association, Ltd.

Mr. J. M. Ainsworth has been appointed secretary of the Vacuum Oil Co. He has been assistant secretary since April, 1930.

Mr. J. W. Cartwright has retired from the position of works manager to Messrs. Heyes & Co., Wigan, and has been presented with a wallet of notes. The presentation was made by Mr. A. V. Heyes, who is general manager of the company, at a dinner and dance which the company organised recently.

We regret that in our last issue **Mr. P. N. Rand's** name incorrectly appeared under the portrait of Mr. H. Maughan. Mr. Rand, who, as we announced, has been appointed chairman of Electrical & Engineering Products, Ltd., is, of course, well known in the electrical industry through his past association with the English Electric Co., Ltd., and the Metropolitan-Vickers Electrical Co., Ltd. We now have pleasure in reproducing his portrait, herewith.

[*Elliott & Fry*

Mr. P. N. Rand

Mr. Maughan, as we have already announced, has been appointed sales engineer for the switchgear products of Messrs. Drake & Gorham, Ltd., in the counties of Lancashire, Cheshire, Westmorland and Cumberland.

Mr. W. B. Challen, M.I.Mech.E., was presented with a silver salver and coffee set at a complimentary dinner which was given in his honour at the Queen's Hotel, Birmingham, on January 31st. The occasion was an appreciation of his services as trustee of the James Watt Memorial Fund in bringing to fruition the James Watt Memorial Institute, which is now a meeting place for all engineering and kindred societies in the Midlands. About seventy persons attended including chairmen, secretaries and most of the committees of the local centres of the various engineering institutions. In the absence through illness of Sir Gilbert Barling, the chair was taken by Mr. R. A. Chattock, who, in making the presentation, said that the James Watt Memorial Fund was originally formed in 1919, Birmingham being chosen as a James Watt centre of activities. The Institute was opened last year, utilising part of the original fund of £10,000, the remainder being put aside for the Department of Mechanical Engineering at the University, and the creation of a James Watt Fellowship.

Dr. René Thury, of Geneva, Switzerland, who has been elected an hon. member of the Institution of Electrical Engineers, has been responsible for many important electrical developments including the Thury voltage regulator. He was also a pioneer on the Continent of the electrical transmission of power by d.c. at high voltage.

Sir Frank E. Smith, has been awarded the Faraday Medal by the Institution of Electrical Engineers. He was formerly secretary of the Department of Scientific and Industrial Research and is now secretary of the Royal Society. He has written a large number of scientific papers mostly on electrical and magnetic subjects. In April last year he delivered the Kelvin Lecture on the travel of wireless waves.

Sir Frank E. Smith, who has been awarded the Faraday Medal by the Institution of Electrical Engineers

Obituary

Mr. J. Jones.—We regret to record the death in a nursing home in Llandudno on January 29th of Mr. John Jones, of Leeds, who had been in the service of the Edison Swan Electric Co., Ltd., for thirty-six years. He joined the company as showroom assistant in Liverpool, becoming branch manager at Leeds in 1923. He held this position until 1930 when the supplies side of the British Thomson-Houston Co., Ltd., and Metro-Vick Supplies Co., Ltd., were merged into the Edison Swan Electric Co., and he was transferred to the Battery Department, taking responsibility for that department in the North of England. The interment took place in Liverpool on February 2nd, those present including Mr. A. E. Smith, representing the directors of the company, Messrs. W. Garsden and D. Pearson, representing the Manchester and Leeds Ediswan branches, and Mr. E. G. Sellers, representing the Leeds Electric Club.

Mr. J. Strachan.—The death has occurred in Trinidad, at the age of fifty-six, of Mr. John Strachan, Director of Transport. He was the son of Mr. John Strachan, A.M.Inst.C.E., and entered the Public Works Department of Ceylon and became assistant director. In 1920 he was appointed to a similar post in the Federated Malay States, where he became chairman of the Electrical Board. He returned to Ceylon as Director of Public Works, and was also chairman of various boards, including the Electrical Board. In 1927 he was appointed general manager and chief engineer of the Federated Malay States Railways, and served on a number of committees and boards in those States. He was a member of the Institutions of Civil and Structural Engineers, and of the Institute of Transport, and was president of the Engineering Association of Malaya and of the Malayan Branch of the Institution of Civil Engineers.

Mr. J. Brown.—Old Cromptonians will learn with regret of the death last week of Mr. Jack Brown, who held the record for long service with the Crompton organisation. He joined the firm in May, 1880, at the age of thirteen, and was continuously employed at the Chelmsford works until his death. His earlier employment included work on the motors for the Southend Pier trams in the 'eighties, and the first electric locomotives supplied to the City and South London Railway.

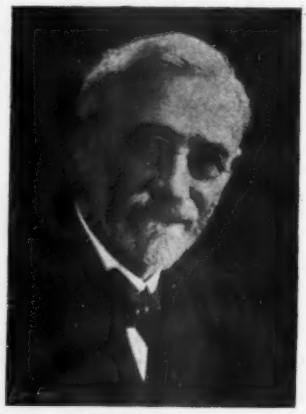
Mr. K. Preston.—The death occurred on Sunday, January 28th, after a long illness, of Mr. Kenneth Preston, M.I.E.E., H.M. Electrical Inspector of Factories. Mr. Preston, before joining the Department in 1927, was chief electrical engineer to the North-Western Railway, India. His appointment under the Home Office made him a well-known figure in Birmingham and the West Country. His helpful and constructive methods of inspection were much appreciated, and his death will be regretted by his many friends both inside and outside the Department. He became an associate member of the Institution in 1912, and a full member in 1923.

General von Sickt, head of Siemens China, Ltd., has died in Hong Kong.

Prof. F. Haber.—The death has occurred at Basle, at the age of sixty-five, of Prof. Fritz Haber. He was the author of a number of works on electrochemistry and the thermodynamics of gas reactions, and his researches led to a process of synthesising ammonia from hydrogen and the nitrogen of the air which has met with a great deal of success.

Mr. G. Faccioli.—The death of Mr. Guiseppe Faccioli, a well-known American expert on high-voltage transmission problems, on January 13th, of pneumonia, at the age of fifty-six years, is recorded in the *Electrical World*. He died at his home at Pittsfield, Mass., where the General Electric Works, with which he became identified in 1908, are situated. For a considerable time he was associated with the late Dr. C. P. Steinmetz, whose memorable researches in lightning Faccioli continued after Steinmetz's death. He was born in Rome, and received his electrical and mechanical training at the Institute of Technology in Milan. His early American interests were with the New York Edison, the Crocker-Wheeler, and other concerns. He was a hard worker for the American Institute of Electrical Engineers, which in 1931 awarded him the Lamme Medal in recognition of his researches.

Mr. T. Westgarth.—Mr. Tom Westgarth, who died on January 30th at Hessle, near Hull, aged eighty-one years, was until recently a director of Richardsons, Westgarth & Co., Ltd., of Hartlepool. For more than fifty years he had been a leading figure in engineering circles on Tees-side. In 1881 he founded the marine engineering firm of Westgarth, English & Co., Middlesbrough, and was later connected with various other engineering works which went through various changes and amalgamations until eventually the business took its present well-known title: Richardsons, Westgarth & Co., Ltd., with Messrs. T. Westgarth and the late W. B. Morison as joint managing directors. Mr. Westgarth resigned that office in 1912, but remained on the board until a few months ago. He not only had a wide experience of marine engineering, but was an authority on steel works and rolling mill plant, and was closely associated with the design and construction of a two-stroke self-acting marine Diesel engine as far back as 1912, in conjunction with Carels Frères of Ghent. When the works of the Cargo Fleet Iron Co., Ltd., were laid out at Middlesbrough a contract was successfully carried out by Furness, Westgarth & Co., Ltd., for the whole plant, including buildings, rolling mills, engines and boilers, gas-cleaning apparatus, etc. The chief feature of these works was the introduction upon a large scale of engines for blowing the blast furnaces and driving dynamos by the use of the surplus gases from the blast furnaces and coke ovens, gas cylinders of 51½ in. in diameter being used. This bold step was carried out by Mr. Westgarth under the patents of the Belgian firm of John Cockerill & Co., and led to great developments in the use of waste gases in Great Britain. During the War he took part in organising a shell factory, and he also rendered service as chief inspector of inland engine shops under the Controller-General of Merchant Shipbuilding. He was president of engineering institutions in the district, and was closely associated with philanthropic enterprises, but took no active part in public life. The funeral took place at Hessle Parish Church last Friday.



The late Mr. T. Westgarth

Mr. R. J. Cochrane.—The death occurred recently in New Brunswick, at the age of eighty, of Mr. Robert J. Cochrane, a pioneer of the Canadian electrical industry. According to the *Electrical World*, when he retired in 1932 he had been on the staff of the New Brunswick Power Co. for forty-eight years, and had directed all construction work for the company for thirty-five years.

The Lac Noir Power Station Catastrophe

LAC NOIR power station, which was considerably damaged recently owing to a pipeline burst, was put into commission last November. It works in conjunction with the power stations at Kembs, surplus energy from which is used to pump water to Lac Blanc at a higher level, whence it runs down during peak loads for producing electricity at Lac Noir to an amount of about 400,000 kWh daily.

The plant comprises four 25,000-kVA 12-kV motor generators, four 30,000-kW (highest head) Francis turbines, three 20,000-kW centrifugal pumps, and one 12,500-kW centrifugal pump. The pumps, turbines and generators are rigidly coupled, so that the impellors and runners always rotate. The blades of the turbines and pumps are of the adjustable "Fink" type, and each unit can be started as a pump, turbine, or synchronous motor. Only two sets have been completely installed so far.

The cause of the trouble (which resulted in the death of nine men) was the bursting of a connecting angle of a manhole in the distributing piping, owing to two faults hidden in the material. The distributing piping was torn open for a length of about 25 ft. and a width of about 8 ft. The fracture was in no instance at a point where the seam had been welded, nor does it run at any point parallel with or near to a weld.

The fracture of the pipe caused a sudden reduction in pressure, and the only pump in operation at the time, which was loaded at 8,000 kW, was damaged in its guide-wheel regulating gear. This was held rigidly by the servomotor, and as the pipe line was thus open there can be no question of water-hammer. The jet of water which emerged caused a short circuit on the h.v. line near by and shut down the whole plant.

A committee has been appointed to investigate the causes of the pipe fracture, but we are informed by the Escher Wyss Engineering Works, Ltd., which supplied the turbines and pumps and erected the pipeline, that the faulty pipe was not of their manufacture. Illustrations of the station appeared on page 51 of our issue of January 12th.

Midland Electrical Engineers' Ball

The Midland Electrical Engineers' Ball Committee has sent to the Institution of Electrical Engineers' Benevolent Fund a contribution of £70 as a result of the Ball held in November last.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

L. Norman Vivian, Ltd.—Private company. Registered January 31st. Capital: £2,000 in £1 shares. Objects: To carry on the business of automobile electrical engineers and contractors, designers and manufacturers of electrical fittings, lighting, self-starting and power sets for automobiles, &c. The subscribers are: L. N. Vivian, St. Anne's House, High Road, Hayes, Middlesex, and others to be appointed by the company or subscribers. Secretary: Alfred D. Wells.

South Western Radio & Accessory Stores, Ltd.—Private company. Registered January 27th. Capital: £250 in 5s. shares. Objects: To acquire the business of a radio dealer now carried on by Richard H. Lott at 116, Upper Tooting Road, S.W.17, as "The South Western Radio & Accessory Stores," and to carry on the business of manufacturers, distributors and retailers of radio sets, gramophones, television, electrical and gas appliances and accessories, &c. R. H. Lott, 66, Brudenell Road, Upper Tooting, S.W.17, is the first permanent director.

Midland Wireless Relay Co., Ltd.—Private company. Registered January 31st. Capital: £500 in £1 shares. Objects: To carry on the business of manufacturers, factors and dealers in wireless, electrical and mechanical goods, relayers of wireless programmes, &c. The directors are: R. Ingham, 6, Whalley Road, Padiham, H. B. Blundell, "Caledonia," Beauley Avenue, Read, Lancs, and L. F. Ingham, 6, Whalley Road, Padiham. Registered office: 102, Manchester Road, Burnley.

W. L. & F. M. Jones, Ltd.—Private company. Registered January 30th. Capital: £500 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in electrical signs and devices, electrical accumulators, batteries, converters, &c. The directors are: R. Davison, Radio House, High Street, Cobham, Surrey, and F. W. Embery, 11, Tilt Close, Stoke D'Abernon, Surrey. Secretary: Daisy L. Davison. Registered office: Radio House, High Street, Cobham, Surrey.

Electrical Appliances Guarantee Co., Ltd.—Private company. Registered January 30th. Capital: £1,000 in £1 shares. Objects: To carry on business as financiers, capitalists, concessionaires, and to lend money to finance hire-purchase agreements, &c. G. H. Landugan, 184, Thorne Road, Doncaster, signs documents as director. Secretary: Walter E. V. Hayes. Registered office: Exchange Buildings, Market Place, Doncaster.

Safe-Neon, Ltd.—Private company. Registered January 27th. Capital: £100 in £1 shares. Objects: To carry on the business of electricians, mechanical and radio engineers, and manufacturers, workers and dealers in electricity, motive power and light, neon-sign, television apparatus and gramophone manufacturers, &c. The subscribers are: G. E. Bacher, "Merrian," Southview Drive, Walton-on-Naze, and A. B. Griffiths, "Merrian," Southview Drive, Walton-on-Naze. Secretary: A. B. Griffiths.

Scientific Developments, Ltd.—Private company. Registered February 2nd. Capital: £100 in £1 shares. Objects: To acquire any patents or inventions connected with scientific development, and to carry on the business of scientific, electrical, radio and general mechanical engineers, &c. The first directors are: L. Smith, 18, Gray's Inn Road, W.C.1, and Carl W. Hansell, address not stated.

Returns of Electrical Companies

Greenwood & Batley, Ltd.—Capital, £600,000 in 140,000 7 per cent. cumulative preference, 354,585 ordinary, and 105,418 unclassified shares of £1 each. Return dated July 21st, 1933. 110,660 preference and 354,585 ordinary shares taken up. £201,312 paid (being £1 per share on 69,340 preference and 121,340 ordinary, 6s. per share on 14,660 preference and 10s. per share on 12,520 ordinary shares, and including £39 paid on 130 shares forfeited). £247,515 considered as paid on the remainder. Mortgages and charges: £100,000.

White, Drummond & Co., Ltd.—Capital, £350,000 in 360,000 5 per cent. cumulative preference shares of 1s., 360,000 ordinary shares of 3s., and 278,000 ordinary shares of £1. Return dated July 24th, 1933. 360,000 1s. preference and 360,000 3s. ordinary shares taken up, £66,000 paid on 330,000 preference and 330,000 ordinary shares, £6,000 considered as paid on 30,000 preference and 30,000 ordinary shares. Mortgages and charges: Nil.

Wireless Trading Association, Ltd.—Satisfaction in full on January 5th, 1934, of debenture dated December 1st, 1932, and registered December 9th, 1932, securing £1,750.

Hill & Co. (Radio), Ltd.—Satisfaction to the extent of £100 on January 1st, 1934, of debentures authorised June 23rd, 1932, and registered June 29th, 1932, securing £1,000.

Bennie Lifts, Ltd.—Particulars filed of £1,000 debentures authorised January 16th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Super Radio (All Saints), Ltd.—Debenture dated January 15th, 1934, to secure £1,400, charged on the company's property, present and future, including uncalled capital. Holder: Mrs. F. R. Freeman, 24, Ullet Road, Liverpool.

British Home & Office Telephone Co., Ltd.—Capital, £10,000 in £1 shares. Return dated July 4th, 1933. 5,230 shares taken up. £5,230 paid. Mortgages and charges, nil.

British Automatic Refrigerators, Ltd.—Issue on January 11th, 1934, of £10,000 debentures, part of a series already registered.

Sign Transformer Co., Ltd.—Particulars filed of debentures not exceeding £1,000 authorised January 9th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,000.

Henley's (South Africa) Telegraph Works Co., Ltd.—Capital, £2,000 in £1 shares. Return dated July 7th, 1933. All shares taken up. £2,000 paid. Mortgages and charges: Nil.

Hall's Longitudinal Lighting Co., Ltd.—Capital: £5,000 in 1,250 ordinary shares of £1 and 75,000 deferred shares of 1s. each. Return dated July 26th (filed November 8th), 1933. 20,200 deferred shares taken up. £1,010 paid. Mortgages and charges: Nil.

Collins, Brown & Co., Ltd.—G. H. D. Soames, 9, Laurence Pountney Hill, E.C., was appointed receiver on January 23rd, 1934, under powers contained in debentures dated December 14th and 15th, 1933.

Bevan's Radio Supplies, Ltd.—Particulars filed of debentures for not more than £250 authorised January 15th, 1934, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £250.

Musselburgh & District Electric Light & Traction Co., Ltd.—Satisfaction to the extent of £1,600 on December 31st, 1933, of 5 per cent. debentures authorised by resolutions dated November 13th, 1905, and April 8th, 1909, and registered May 12th, 1909, securing £90,000.

Torquay Tramways Co., Ltd.—Satisfaction to the extent of £1,900 on September 30th, 1933, of trust deed authorised by resolution dated February 21st, 1911, and registered March 15th, 1911.

Shoreham & District Electric Lighting & Power Co., Ltd.—Satisfaction to the extent of £10,000 on January 1st, 1934, of debenture dated March 19th, 1926, and two mortgages dated December 9th, 1926, and February 16th, 1932, and registered March 24th, 1926, December 11th, 1926, and February 18th, 1932, respectively.

City Notes

The East African Power & Lighting Co. is offering 195,000 £1 shares to existing holders at 26s. 6d. a share in the proportion of three for each 10 per cent. preference or ordinary share now held. The proceeds of the issue will be utilised to develop the hydro-electric concession owned by the Tanganyika Electric Supply Co., the whole of the share capital of which is owned by the company. The offer closes on February 22nd.

Companies Struck off the Register.—The names of the following companies have been struck off the Register and they are thereby dissolved:—International Wireless Manufacturers, Ltd.; Radio Transformer Co., Ltd.; United Welding & Electrical Co., Ltd.

Electrical & Industrial Investment Co., Ltd., has announced a dividend of 8 per cent. for 1933 (same) on the deferred ordinary shares.

The Dublin United Tramways Co., Ltd., has declared a final dividend of 2 per cent., less tax, making 3 per cent. for the year (unchanged). A sum of £14,374 is carried forward against £14,184 brought in.

The Siemens & Halske A.G. announces a dividend of 7 per cent. from a net profit of Rm. 9,000,000. No. dividend is declared by the Siemens Schuckert Co., whose annual report records a deficit, which is covered from reserve.—*Reuter.*

The Westminster Electric Supply Corporation, Ltd., has declared a final ordinary dividend of 4½ per cent., making the standard dividend of 7 per cent. for 1933.

The London Electric Supply Corporation, Ltd., has declared a final ordinary dividend of 4 per cent., making 7 per cent. for the year.

The Northampton Electric Light & Power Co., Ltd., has recommended a final dividend of 6 per cent. on the ordinary shares, making 10 per cent. for the year (same). The annual meeting will be held on February 27th.

The Rushden & District Electric Supply Co., Ltd., proposes to pay a final dividend of 4½ per cent., maintaining the distribution for the year at 8 per cent. Meeting: February 27th.

Stocks and Shares

TUESDAY EVENING.

THE Stock Exchange is very busy at the present time with a wave of speculation that has set in amongst the various gold-mining markets. On the fixing of the price of gold by Mr. Roosevelt, something of a rush occurred on the part of people attracted by the possibility of a gold share boom, with the result that a bull account became rapidly established, the price of gold—the metal—leading the way in the upward movement. The lay newspapers have exaggerated the position in their ordinary manner, but, allowing for such embroideries, the fact remains that speculation has raised a lively head, and activity in gold-mining shares is everywhere apparent. The bearing which this has upon shares in industrial companies and in stocks of even gilt-edged order is to be seen in the realisation of such humdrum and prosaic issues in order to provide the money needful to pursue the favourites of the moment.

Gold—and the Equipment Companies

It is a little surprising, in the circumstances, that the prices of the older securities keep as good as they do, though

this is no more than an emphasis of the factors, already mentioned here, that fortify gilt-edged stocks and their various circles; namely, the superabundance of money which demands employment, and for which it is difficult to obtain a living rate of interest. The activity in the world of gold mines is leading to developments in new areas, with the result that companies connected with the supply of machinery, &c., to the industry are said to be well supplied with orders. In this direction, the electrical equipment and manufacturing undertakings should participate by indirect reflection from the speculative outbursts caused by the rise in gold. Sobering effects were produced by the French political crisis. Caution stepped in to put a brake upon exuberant bullishness. But the reaction in prices did not go very far.

Electricity Supply Shares

The movements that have occurred in the lists of home electricity supply shares show falls, on balance, Metropolitans being back to 55s., North Metropolitans to 3$\frac{2}{5}$, while Electric Supply Corporation at 77s. 6d. and North Eastern Electrics at 36s. are also lower. Edmundson's ordinary, on the other hand, show a trifling improvement at 39s. The general tendency of the market is slightly easier than it was, as is found by the people who wish to sell shares in order to provide the capital required for use in other markets. Several of the London electricity supply companies have declared dividends for the final half of 1933 that bring the year's distribution to the standard 7 per cent. This is in accordance with anticipations reflected here already. But optimism, as previously observed, had played Oliver Twist, and now is disappointed at the refusal which it met when it asked for more—dividend.

Telegraphs and Telephones

American Telegraph and Telephone shares are 4½ higher at 124½, thanks to a general recovery that lifted most classes of American utilities to higher levels. International Telephones at 17½ are 1 higher. Great Northerns continued their advance with a 5s. gain. A half-crown improvement in Globe Telegraph preference has made the price 12½, though Cables and Wireless stocks are lower; nobody is paying much attention to them at present. The really active shares in this section are Electric and Musical Industries. Mention was made here a week ago of a possible scheme of capital reorganisation that might, if put into effect, help to restore the shares to the list of dividend-payers. A rise of 5s., to 24s. 6d., was succeeded by a slight reaction as profit-takers came on the scene. One interesting rumour hints at the company having acquired an interest in an existing television company that has, according to the same rumour, perfected an apparatus capable of being marketed as a commercial proposition on a large scale. Another interesting movement in this group has been a jump in the price of Canadian Marconi shares. Marconi Marines are unchanged at 31s. 3d. Western Union common stock has gained several points at 65½.

Manufacturing and Equipment

The argument that expansion in the gold-mining industry will increase the demand for electrical machinery and equipment has been already noted. Its force, however, is neutralised by sales of the companies' shares on behalf of people who, some of them, want the money for payment of gold share purchases. Enfields are easier at 96s. 3d.; General Electrics at 44s. 6d.; Brush ordinary has relapsed 2½ to 40, business being officially marked in the stock at 38. English Electrics of both kinds are down ⅛, to 6s. 3d. for the ordinary and 8s. 9d. for the preference. Philips Lamps touched 50s. 3d. before reverting to 49s. 3d. Telephone Rentals are threepence lower at 7s. 6d; Telephone Manufacturing show no change at 3s. 9d. Enfield Rolling Mills came back 2s. 9d. to 30s. Ericssons Telephones at 65s. are better on balance. British Electric Transformer preference hardened to 20s.

Dollar Stocks

Canadian utility shares exhibit readiness to advance upon any demand for them. New York has been buying Montreal Light & Power & Shawinigan shares, the result being improvements to 39 and 22½ respectively. Power Corporation of Canada shares at 12, British Columbia Power "A" at 27, and the "B" at 5¾ have all put on weight. The Montreal Light & Power annual report shows a diminution of earnings, accompanied by reduced expenses. Amongst other dollar issues, Brazilian Tractions rose to 13¾. A minor feature has been a spurt in Hydro Electrics to 8¼. Mexican Light & Power first mortgage bonds regained their last week's loss of 2 points: a rather less melancholy view of Mexican affairs is being taken by financial houses which are in touch with the distressful country.

Miscellaneous Matters

Perak River Hydro-Electric 7 per cent. participating debenture is up 2½ to 54½. Prospective purchasers have found difficulty in obtaining the offer of stock. Iron and steel shares are dull; the French action in connection with the quota is not liked. Babcock & Wilcox are 9d. down at 2½. Better prices are quoted for rubber shares, though business in the market is very sluggish. Atlas ordinary have declined to 8s. 6d. British Power & Light are 20s.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1931.	1932	Price, Feb. 6.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	78/3	−6d.	3 17 0
Brompton Ordinary	1	8½	7	34/-	—	4 2 4
Charing Cross Ordinary	1	8½	7	34/6	—	4 1 2
Chelsea	1	8½	7	34/6	—	4 1 2
City of London	1	10	10	35/-	—	4 0 0
Clyde Valley	1	7	7	41/3	−9d.	3 8 0
County of London	1	10½	10½	57/6	—	3 13 0
Edmundson's 7% Pref.	1	7	7	34/-	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	47/6	—	3 16 0
Elec. Supply Corporation	1	11	11	77/6	−⅛	2 16 8
Kensington Ordinary	1	8	7	34/6	—	4 1 2
Lancs Light and Power	1	7	7	37/-	—	3 15 8
London Electric	1	2	7	34/6	—	4 1 2
Metropolitan	1	10	10	55/-	−9d.	3 12 9
Midland Counties	1	7	7	38/9	−⅛	3 12 2
Mid. Elec. Power	1	8	8	45/-	—	3 11 1
North Eastern Electric Ordinary	1	6	6	36/-	−1	3 6 8
Do. 7% Pref.	1	7	7	34/6	—	4 1 2
Northampton	1	10	10	55/-	—	3 12 9
Notting Hill 6% Pref.	10	6	6	13¾	—	4 8 11
North Met. Elec. Ordinary	1	—	10	3⅛	−⅛	3 2 9
Do. do. 6% Pref.	1	6	6	30/-	—	4 0 0
St. James' and Pall Mall	1	8	7	35/-	—	4 0 0
Scottish Power	1	8	8	2⅝	−⅛	3 17 8
South London	1	8½	7	34/6	—	4 1 2
Westminster Ordinary	1	8½	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/-	+1	6 16 4
Yorkshire Elec.	1	8	8	47/6	—	3 7 3
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	111xd	—	4 10 1
Do. 1955–75	„	5	5	114	—	4 7 6
Do. 1951–73	„	4½	4½	106	—	4 5 0
Do. 1963–93	„	—	3½	94½	—	3 14 1
London & Home Counties, 1955–75	„	4½	4½	108	—	4 3 4
London Passenger Transport, A	„	—	4½	116	—	3 17 7
Do. do. B	„	—	5	120½	−½	4 3 0
Do. do. C	„	—	—	84	−1	—
West Midlands Joint Elec. 1948–68	„	—	5	114	—	4 7 6
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	124½	+4½	7 4 7
Anglo-Am. Tel. Pref.	Stock	6	6	113½	−½	5 5 9
Do. Def.	„	1½	1½	28½	—	5 5 3
Cables & Wireless 5½% Pref.	„	2¾	2¾	72½	−1	3 15 10
Do A 7½% Ord.	„	Nil	Nil	24	−1	—
Do. B. Ord.	„	Nil	Nil	10½	−½	—
Globe Tel. and T. Ord.	10	Nil	2½	10	—	2 10 0
Do. do. Pref.	10	6	6	12½	+½	4 18 0
Great Northern Tel.	10	20	20	36½	+1	3 5 7
Marconi-Marine	1	10	7½	31/3	—	4 16 0
Oriental Telephone Ord.	1	12	12	3½	—	*3 16 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	2/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	„	5	5	510	—	—
Do. do. Pref. Ord.	„	8	8	147½	—	5 8 6
Brazil Traction	100	—	—	13¾	—	—
Brit. Columbia Elec. Rly. Pref.	Stock	5	5	100½	—	4 19 6
Mexico Trams, 5% Bonds	—	5	5	22½	—	22 4 4
Mexican Light Common	100	Nil	Nil	8	—	—
Do. 7% Pref.	100	7	7	11	—	—
Do. 1st Bonds	—	5	5	47½	+2	10 10 6
Victoria Falls Ord.	1	15	20	5⅞	−⅛	3 13 6
Yorkshire (West Riding)	1	Nil	Nil	17/-	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	4	4	19/9	—	3 18 3
Do. Pref.	1	8	8	31/3	—	5 2 5
Babcock & Wilcox	1	14	9	42/6	−9d.	—
British Aluminium Ord.	1	5	5	32/-	—	3 2 6
British Insulated Ord.	1	15	15	75/-	—	4 0 0
Brush Ord.	Stock	Nil	Nil	40	−2½	—
Callender's	1	15	15	65/-	—	4 12 4
Do. 6½% Pref.	1	6½	6½	30/9	—	4 4 6
Crompton Parkinson Ord.	5/-	22½	12½	25/-	—	—
Do. 8% Pref.	1	8	8	31/3	—	5 2 5
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	10/-	—	—
Enfield Cable Ord.	1	25	25	96/3	−¼	5 3 9
English Electric	1	Nil	Nil	6/3	−¼	—
Do. do. Pref.	1	Nil	Nil	8/9	−¼	—
Ever Ready	5/-	35	35	80/-	−3d.	5 16 8
Ferranti Pref.	1	7	7	28/6	—	5 5 9
G.E.C. Pref.	1	6½	6½	30/6	—	4 5 3
Do. Ord.	1	8	8	44/6	−6d	3 12 1
Henley's	1	30	30	6⅛	—	4 15 6
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber Preferred	1	—	—	15/-	—	—
Johnson & Phillips	1	5	5	21/3	—	4 14 1
Siemens Ord.	1	7½	6½	22/-	—	—
Telegraph Construction	£1	Nil	Nil	27/6	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parenthesis are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1932

10163. "Electric measuring instruments." L. Mellersh-Jackson (Siemens-Schuckertwerke Akt.-Ges.). April 8th, 1932. (404291.)

13153. "Production of ultra-violet and luminous radiations by electric discharge apparatus." Soc. Anon pour les Applications de l'Electricité et des Gaz Rares Etablissements Claude-Paz et Silva. December 26th, 1931. (404271.)

16425. "Automatic or semi-automatic telephone or like switching systems." Standard Telephones & Cables, Ltd. (G. Deakin, W. Hatton, and E. J. Rousseau). June 10th, 1932. (404293.)

16461. "Process of and apparatus for standardising magnetic cores." Johnson Laboratories, Inc. June 27th, 1931. (404332.)

16488. "Electron discharge devices." British Thomson-Houston Co., Ltd. June 12th, 1931. (404299.)

19003. "Commutators for dynamo-electric machines." International General Electric Co., Inc. July 7th, 1931. (404276.)

19012. "Ventilation of dynamo-electric machines." General Electric Co., Ltd., and R. Orsettich. July 5th, 1932. (404277.)

19025. "Protective apparatus for electrically operated vehicles." H. K. Ramsden. July 5th, 1932. (Cognate application 24966/32.) (404278.)

19134. "Electric blasting fuses." Thames Ammunition Works, Ltd., and T. Graham. July 6th, 1932. (Cognate application 8297/33.) (404335.)

19387. "Means for comparing the timing of a frequency-controlling clock with that of a standard clock." International General Electric Co., Inc. July 11th, 1931. (404316.)

19407. "Electric discharge apparatus." W. Lehmann. July 13th, 1931. (404283.)

19467. "Gas-filled electric luminous discharge tubes and electrodes therefor." F. Rother. July 10th, 1931. (404285.)

19468. "Electric discharge tubes." F. Rother. July 10th, 1931. (404286.)

19498. "Electric and other imitation fires." Premier Electric Heaters, Ltd., and A. E. Newton. July 9th, 1932. (Cognate applications, 22,512/32, 30201/32, and 30202/32.) (404302.)

19665. "Ignition magnetos for internal combustion engines." J. Lucas, Ltd., and J. A. Laird. July 12th, 1932. (404318.)

19682. "Electric luminous discharge tube advertising or display devices." Claude-General Neon Lights, Ltd., and C. Higgins. July 12th, 1932. (404320.)

19847. "High-pressure metal-vapour arc lamp." Siemens & Halske Akt.-Ges. July 13th, 1931. (404341.)

19936. "Electric communication cables." Standard Telephones & Cables, Ltd., and S. G. Stevens. July 14th, 1932. (404345.)

19968. "Frequency selective circuit arrangements for use in radio reception." Marconi's Wireless Telegraph Co., Ltd., and N. M. Rust. July 14th, 1933. (Cognate application 29752/32.) (404349.)

19969/70. "Radio and other modulated carrier-wave transmitters." Marconi's Wireless Telegraph Co., Ltd., and F. C. Lunnon and E. H. Trump. July 14th, 1932. (404350/1.)

20607. "Processes for impregnating insulating materials of devices intended for electrical purposes." Soc. Italiana Pirelli and L. Emanueli. July 21st, 1932. (404372.)

21017. "Wireless receiving apparatus and the like." J. Croysdale and S. R. Wright. July 26th, 1932. (404376.)

21050. "Electrical measuring devices." General Electric Co., Ltd., and H. C. Turner and J. Grant. July 26th, 1932. (404378.)

21328. "Telegraph systems." Siemens Bros. & Co., Ltd., L. S. Crutch and P. A. Crittenden. July 28th, 1932. (404382.)

22331. "Bolts, rods or the like made of electrically insulating material." British Thomson-Houston Co., Ltd., H. W. H. Warren, G. R. R. Bray and R. Newbound. August 9th, 1932. (404389.)

23579. "Radio receivers." W. H. Grimditch. December 19th, 1931. (404395.)

24328. "Current-collecting devices for electric railway vehicles." F. Whyman and Associated Electrical Industries, Ltd. August 31st, 1932. (404396.)

24882. "Electrically operated sound signals employing vibrating diaphragms." L. J. F. Austin. September 7th, 1932. (404400.)

25147. "Radio receiver." Hazeltine Corporation. May 25th, 1932. (404401.)

26664. "Selecting switches for use in telephone and like systems." Siemens Bros. & Co., Ltd., and C. R. Riber. September 26th, 1932. (404411.)

26800. "Electric cables." C. J. Beaver, E. L. Davey and W. T. Glover & Co., Ltd. September 27th, 1932. (404412.)

29460. "Grid control of mercury-vapour valves." Brown, Boveri et Cie., Akt.-Ges. October 21st, 1931. (404425.)

30203. "Electric and other imitation fires." Premier Electric Heaters, Ltd., and A. E. Newton. October 27th, 1932. (404428.)

32291. "Reflectors for portable battery lamps." General Electric Co., Ltd., W. Harrison and R. J. Kaula. November 15th, 1932. (404434.)

35979. "Luminous electric discharge tubes." General Electric Co., Ltd. December 24th, 1931. (404448.)

36002. "Methods of, and apparatus for, manufacturing electric lamps." British Thomson-Houston Co., Ltd. December 18th, 1931. (404449.)

36791. "Vacuum electric discharge tube containing rarefied gas or vapour, and the production, amplification or reception of high-frequency oscillations." Naamloose Vennootschap Machinerieen-en Apparaten Fabrieken. March 3rd, 1932. (404455.)

1933

2908 and 2910. "Railless bus trolley-pole structures." Brecknell Willis & Co., Ltd., and A. M. Willis. January 30th, 1933. (404467/8.)

3342. "Electric switches operated by fluid pressure." Automotive Products Co., Ltd., and E. B. Boughton. February 3rd, 1933. (404470.)

4473. "Electrically driven screwdrivers." R. Bosch Akt.-Ges. March 5th, 1932. (404477.)

6500. "Construction of electric cables." Okonite-Callender Cable Co., Inc. March 3rd, 1932. (404487.)

7299. "Electric insulators." W. W. Triggs (Ohio Brass Co.). March 10th, 1933. (404489.)

7882. "Mounting of dynamos on internal-combustion engines." Aktieselskabet Fisker & Nielsen and P. A. Fisker. March 15th, 1933. (404493.)

8053. "Electric switches operated by gas under pressure." Brown Boveri et Cie, Akt-Ges. March 16th, 1932. (404497.)

8154. "Apparatus for measuring alternating electric current." International General Electric Co., Inc. March 18th, 1932. (404498.)

8279. "Electrode for electric arc welding." Naamlooze Vennootschap Machinerieen-en Apparaten Fabrieken. April 12th, 1932. (404500.)

8678. "Electric-arc welding with jacketed metal electrodes." J. T. Shevlin (Naamloose Vennootschap Machinerieen-en Apparaten Fabrieken). March 22nd, 1933. (404503).

8860. "Sockets for plug-and-socket contacts." Stocko Metallwarenfabriken Ges. June 24th, 1932. (404505.)

9111. "Make-and-break mechanism for use in electrically operated diaphragm horns." L. J. F. Austin. March 27th, 1933. (404508.)

10405. "Electrical tumbler switches." A. Watson. April 7th, 1933. (404511.)

11491. "Method of, and means for, effecting the automatic regenerating of received Wheatstone telegraph signals." T. C. V. Nielson. July 23rd, 1932. (404514.)

12451. "Electric cables for high voltages." Naamlooze Vennootschap Hollandsche Draad-en Kabel-Fabriek. April 29th, 1932. (404519.)

13372. "Playing of music by electrical means." G. Leithauser, M. Liebau and H. Wallor. December 24th, 1932. (404524.)

14337. "Quick-action electric switches." Stotz-Kontak Ges. May 20th, 1932. (404528.)

14833. "Electrically operated sound-signalling instruments employing vibrating diaphragms." L. J. F. Austin. September 7th, 1932 (Divided application on 404400). (404532.)

15248. "Electro-deposition of tin." Harshaw Chemical Co. January 28th, 1933. (404533.)

15524. "Automatically-tripped electric switches." W. Stahel. May 27th, 1932. (404536.)

17133. "Railless bus trolley-pole structures." Brecknell Willis & Co., Ltd., and A. M. Willis. June 15th, 1933. (404542.)

17200. "Material for magnetic cores formed of layers." H. Vogt. June 16th, 1933. (404544.)

17854. "Devices for holding electrodes for electric-arc welding." Naamloose Vennootschap Machinerieen-en Apparaten Fabrieken. July 15th, 1932. (404359.)

20299. "Electrically-operated gauges for indicating liquid levels." G. W. Parr and Bircheen Assets, Ltd. July 18th, 1933. (404558.)

21105. "Electric resistance welding machines." British Electric Welding Machines, Ltd., and H. W. Wolton. July 27th, 1933. (404562.)

22448. "Radio communication systems." Soc. Francaise Radio-Electrique. August 12th, 1932. (404574.)

23011. "Electric incandescent lamps." W. Honing and G. Oudemans. August 17th, 1933. (404578.)

23707. "Radio receivers." Marconi's Wireless Telegraph Co., Ltd. August 25th, 1932. (404583.)

23760. "Electrically-operated water-heating system." C. E. Stuart. August 29th, 1932. (404584.)

23867. "Methods of, and apparatus for, making sheaths for cables." British Thomson-Houston Co., Ltd. August 26th, 1932. (404585.)

26032. "Electric blasting fuses." Thames Ammunition Works, Ltd., and T. Graham. July 6th, 1932 (Divided application on 404335). (404361.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 31st:—

Crypto. No. 545098. Class 6. Electric mixing machines, potato peelers, polishing machines, bread-cutting machines, boot-cleaning machines, fruit-stoning machines, plate- and china-washing machines, knife-cleaning machines, and clothes-washing machines.—Lancashire Dynamo & Crypto, Ltd., Trafford Park, Manchester.

Edó. No. 545130. Class 8. Electric lighting flexibles and cables.—Joseph Weinbaum, trading as the Stormlight Incandescent & Electric Co., 160-164, Mile End Road, E.1.

Hupit. No. 546777. Class 13. Electrodes of ordinary metal.—James Gillespie, 105, Randle Road, Jordan Hill, Glasgow.

Tenbyluxe. Nos. 546964, Class 13, and 546965. Class 50. Electric lighting, heating and power fittings of ordinary metal and also made of synthetic resin.—S. O. Bowker, Ltd., Tenby Works, Regent Row, Birmingham.

Rhino. No. 546253. Class 40. India-rubber-covered wire.—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

German Electricity Supply Association

All the leading electricity supply associations in Germany have now been combined in the Reich Verband der Elektricitäts Versorgung for the purpose of bringing about, among other matters, the active co-operation of the supply works in technical and economic developments.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abbots Langley (WATFORD).—Cinema, for W. H. Luck.

Barnsley.—New block for Kendray Fever Hospital; borough engineer.

Barnstaple.—Houses (60); borough surveyor. Houses (250), Anchor Wood Estate; W. Woolaway & Sons, builders, Bickington Road.

Berwick-on-Tweed.—Houses (100); borough engineer.

Bexhill-on-Sea.—Entertainments hall (£58,260); Erich Mendelsohn & Serge Chermayeff, architects, 173, Oxford Street, London, W.

Birmingham.—Houses (800), Hamstead Hall; Hamstead Hall Estate Co. Houses (700), Lindsworth Hall Farm Estate, King's Norton; Estate Co. Factory, Hockley Hill, for Hewlett & Co. (£20,000) with electrical work; T. Elvins & Son, builders, Soho Hill. Extensions to Reynolds Tube Co., Tyseley (£20,000) with electrical work; Rubery Owen & Co., engineers, Norwich Union Chambers, Edmund Street.

Blackheath (WORCS).—Cinema, Long Lane; Housing, Ltd., builders.

Bristol.—Houses (44), Knowle Estate, Knowle (£12,364); J. Knox, builder.

Burnopfield.—Houses (36); N. T. Barker, builder, Winlaton Mill.

Burton-on-Trent.—Drill hall for Staffordshire Territorial Army Association (£5,585); secretary, Stafford.

Castle Bromwich.—Factory, Woodlands Farm Road (£20,000) with electrical work; S. J. Smith (Bidford), Ltd., builders, 99, Corporation Street, Birmingham.

Chelmsford.—Sewage works, with electrically driven plant (£43,000); Silcock & Simpson, engineers, Westminster, S.W.

Cheshire.—Electric lighting for eight institutions, for County P.A.C.; William H. Owen, P.A. Officer, Bridgegate House, Chester.

Coventry.—Church, St. Mary Magdalene, Earlsdon (£11,000) with electrical work; E. Harris & Son, builders, Cope Street.

Cumberland.—Extensions, County High School for Girls, Carlisle, and the Grammar School (£16,500); P. Dalton, city engineer.

Darlington.—Extensions to Poor Law Institution (£3,500); W. J. Merrett, county surveyor, 43, Old Elvet.

Dewsbury.—Houses (80), Council estates; borough engineer.

Dudley.—Houses (68) and four blocks of flats, Wolverton Road, with electrical work; F. H. Gibbons, borough engineer, Priory Hall.

Durham.—Alterations to vagrancy wards, Poor Law Institution (£3,542); Gordon Durham and Co., builders, East Boldon.

Edinburgh.—New wing to the St. Raphael's Nursing Home, Blackford Avenue (£15,000); J. Douglas Miller, architect, 5, Forres Street. Extension to Herriot Watt College (£55,000); Extension Office, Cowgate.

Essex.—Remodelling Palmer's Endowed School for Boys, Grays (£20,000); director of education, Chelmsford.

Falkirk.—New buildings (£50,000) for the Falkirk and District United Co-operative Society; M. J. G. Callander, architect.

Glasgow.—Houses (80), Anderson Foundry site, and 63 houses, Syrian Street; Housing Director. Reconstruction of Woodside baths (£19,500); city engineer.

Gloucestershire.—Additions to Technical College (£1,200), for County E.C.

Grantham.—Hospital extensions; F. J. Lenton, of Traylen & Lenton, architects.

Guildford.—Cinema (£50,000) for Astoria (Guildford), Ltd.; S. H. Burdwood, architect, 80, George Street, Baker Street, London, W.

Hampshire.—Schools, Butlock's Heath, Farnborough (£30,000), and extension to Hedge End, for County E.C.

Hertford.—Public baths (£8,000); borough surveyor.

Hertfordshire.—Schools, Leavesden Green, Watford; Osidge, East Barnet; Mill End, Rickmansworth; and Goffs Oak, Cheshunt; and extensions, Boreham Wood schools (£6,326), for County E.C.; director of education, Hertford.

Hetton (DURHAM).—Houses (133); U.D.C. surveyor.

Hull.—Coach station (£11,860); C. D. Kettlewell.

Huthwaite.—Houses (40), Chesterfield Road; E. W. Bostock, U.D.C. architect, Morven Avenue, Hucknall, Notts.

Ilford.—School (700 places), Fencepiece Rd., for Borough E.C.

Inverness.—Reconstruction of cinema and conversion into up-to-date theatre, for the directors of New Inverness Picture Houses; the manager.

Kent.—Schools, Mottingham, Dartford, and Tonbridge, for County E.C.; director of education, Maidstone. Extensions, Day's Lane school, Sidcup; county architect, Maidstone.

Knowle (WARWICKSHIRE).—Houses (200), Milverton Estate; Satchwell & Roberts, architects, 6, New Street.

Lancaster.—Houses (50), Ryelands Estate; borough engineer.

Lanchester.—Conversion of Poor Law Institution into general hospital; R. B. Hindmarch, County Public Assistance Officer.

London.—(FRIERN BARNET).—Houses (35), Cardrew House Estate; H. Davies. (ISLINGTON).—Extensions, Shepperton Road School; L.C.C. architect. (LAMBETH).—Reconstruction of Tyers Street (£303,000); L.C.C. architect. (LEE).—Flats, High Road; Hoad & Harrison, Ltd. (LEWISHAM).—School (700 places), Cooper's Lane, for E.C.; director of education. (MILE END).—Enlargement to St. Bernard's Catholic School: managers. (SHOREDITCH).—Tenements, Provost Street (£28,300); Unit Construction Co., Ltd. (SOUTHGATE).—Houses (60), Powys Lane; W. Seymour Crouchman & Sons. Houses (16), and flats, Uplands Estate; Ideal Housing Co. Cinema, at the corner of The Bourne and Wynchgate; T. Woolnough.

Manchester.—Houses, St. Clements (£160,000); city architect. Cinema, Wythenshawe, for Mrs. Burns, proprietor, Electra Cheadle; G. & W. Smith (Builders), Ltd., Hyde Grove, Plymouth Grove.

Mansfield.—Houses (44), Cornwall Avenue; C. H. Hill. Houses (40), Rehousing Estate (£16,800); borough engineer.

Merthyr Tydfil.—Houses (624); A. J. Marshall, borough engineer.

Middlesbrough.—Houses, Cromer Street; Thompson & Halliman, builders, Emmerson Street. Houses (1,080), for the Middlesbrough and District Building Trades Federation; Archibald & Archibald, architects, 26, Albert Road. Houses, Studley Road; T. Duncanson, builder.

Middleton.—Houses (44), Hilton Fold Lane; J. Chapman & Sons, Ltd., builders, Wadsley Bridge, Sheffield.

Mitcham (SURREY).—Factory for Philips Radio Co.

Monkseaton (NORTHUMBERLAND).—Cinema, Cauldwell Lane (£12,500); L. A. G. Pritchard, architect, 34, Moorfields, Liverpool.

Morecambe.—Church, Longton Drive; Methodist trustees.

Mytholmroyd.—Extensive business premises, Burnley Road; G. R. Oddy, architect, Ward's End Chambers, Halifax.

Newcastle-on-Tyne.—Houses (54), Armstrong Road; W. C. Leech, builder, Coutts Road, Walkergate. New hospital, in grounds of the Mary Magdalene Hospital (£16,500); city architect.

Newcastle (STAFFS).—Police headquarters; town clerk.

Northern Ireland.—(BELFAST).—Houses (300), Knockbreda Road; Thos. McKee & Sons. Houses (10), Pommern Parade, for James Carnduff; T. Murdoch, architect. Houses (10), Westbourne Street, for J. R. & W. C. McKee.

Northumberland.—School, Choppington, Guide Post (£3,677); J. Goulding, builder, Blyth. Extensions of Research station, Cockle Park, for County E.C.

Oxford.—School, Cowley district, for E.C.; director of education.

Peterborough.—Extensions to Walton school (£7,000), for Borough E.C.; director of education. Employment exchange (£5,489); J. Guttridge & Sons, Ltd., builders.

Rochdale.—Houses (220), Brimrod Estate; J. Hobson & Sons, Ltd., builders, 55, Newark Street, Nottingham. Extensions, Heybrook Council School (£3,400); James Mann (New Hey), Ltd., builders, Milnrow Saw Mills.

Rochester.—Operating theatre unit (£7,000), St. Bartholomew's Hospital; C. F. Speyer, secretary. School (500 places), Temple Farm Estate, for City E.C.; director of education.

Romford.—Arcade of shops, South Street, for W. Goodchild. Houses (52) and flats, Rush Green Road; Bailey & Goates, Ltd., builders.

Rugby.—Houses, Addison Road; borough surveyor.

Runcorn.—Houses, Hinton Road, and shops and houses, Heath Road Estate; S. V. Broadbridge, Ltd., builder, Greenway Road, Timperley, Altrincham.

Salford.—Extensions to Royal Museum and Art Gallery, Peel Park (£20,000); borough surveyor.

Scarborough.—Hotel, Scalby Road (£120,000); W. Marchment, architect, 11, Stanley House, Larkhall, S.W.8.

Sheffield.—Cinema and billiards hall, Beck Road, Shire Green, for the Shire Green Cinema Syndicate, Ltd.; C. B. M. Wilson, architect, Campo Chambers, 30, Campo Lane.

Shrewsbury.—Houses (54), Ditherington; A. W. Ward, borough surveyor, The Guildhall.

Southall.—Municipal offices, fire station, &c., St. Joseph's School site; U.D.C. surveyor.

Southampton.—New Town Hall (£160,000); William T. Nicholls, Ltd., Gloucester.

South Shields.—Houses (500), West Harton (£154,633); J. Reid, borough engineer.

Stanley (DURHAM).—New premises for the West Stanley Co-operative Society.

Stockport.—Radiography block, Steeping Hill Hospital for Board of Management; Hibbert & Penn, builders, Prince's Street. R.C. school, Edgeley; H. McGeever, chairman of the Committee of Management.

Stokenchurch (BUCKS).—Re-erection of sawmills (£2,000), for C. R. Bates.

Stoke-on-Trent.—Houses (233) and baths (£60,000); city surveyor.

Stratford-on-Avon.—Telephone exchange, for H.M. Office of Works, King Charles Street, London, S.W.

Stroud.—Offices, for Holloway Benefit Society (electrical work); Gardner & Son, builders.

Sunderland.—Junior Technical School (£28,697), and special school for the blind, Seaforth (£12,710), for County E.C.; O. T. Mark, architect, Town Hall. Extensions to Hedley & Swan's drapery premises, High Street. Extensions to Town Hall; T. P. Collinge, borough engineer.

Surrey.—General hospital, St. Helier housing estate, Carshalton (£50,000), for C.C.; clerk, Kingston-on-Thames.

Thetford.—Development of Croxton Road, for Sir William Gentle; Oldman & Sons.

Tipton.—Houses (£69,300); U.D.C. surveyor.

Tynemouth.—Houses, Spring Gardens; Ball Bros., builders, North Shields.

Walsall.—School, Wolverhampton Road, for Borough E.C.; director of education.

West Riding.—Senior school, Darton, for County E.C.; education architect, Wakefield.

Whickham-on-Tyne.—Houses (98), for Capt. Carr-Ellison, Collingwood Buildings, Newcastle-on-Tyne.

Wolverhampton.—Block of shops and showrooms, Victoria Street; T. Wynne Thomas, of Nicol & Nicol & Thomas, architects, Colmore Row, Birmingham. Factory, Bilston Road, for Spencer & Co., Eagle Street (£5,000), with electrical work; Perks & Gould, builders, Shale Street, Bilston, Staffs.

Worthing.—Houses (200), Durrington; borough surveyor.

York.—Houses (176), Huntington Road; city surveyor. Estate development, Fulford Road; Fairbank & Son.

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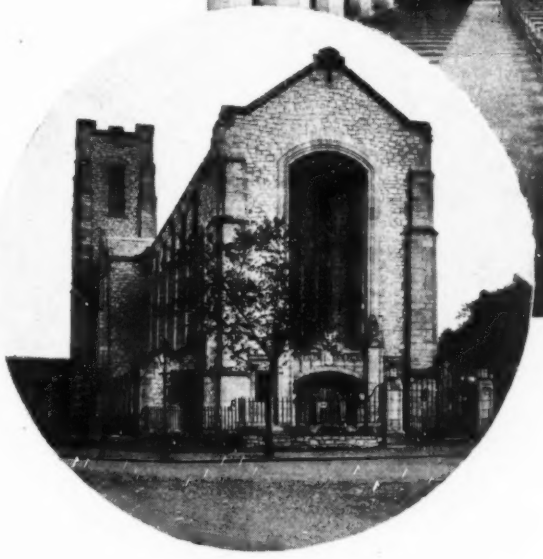

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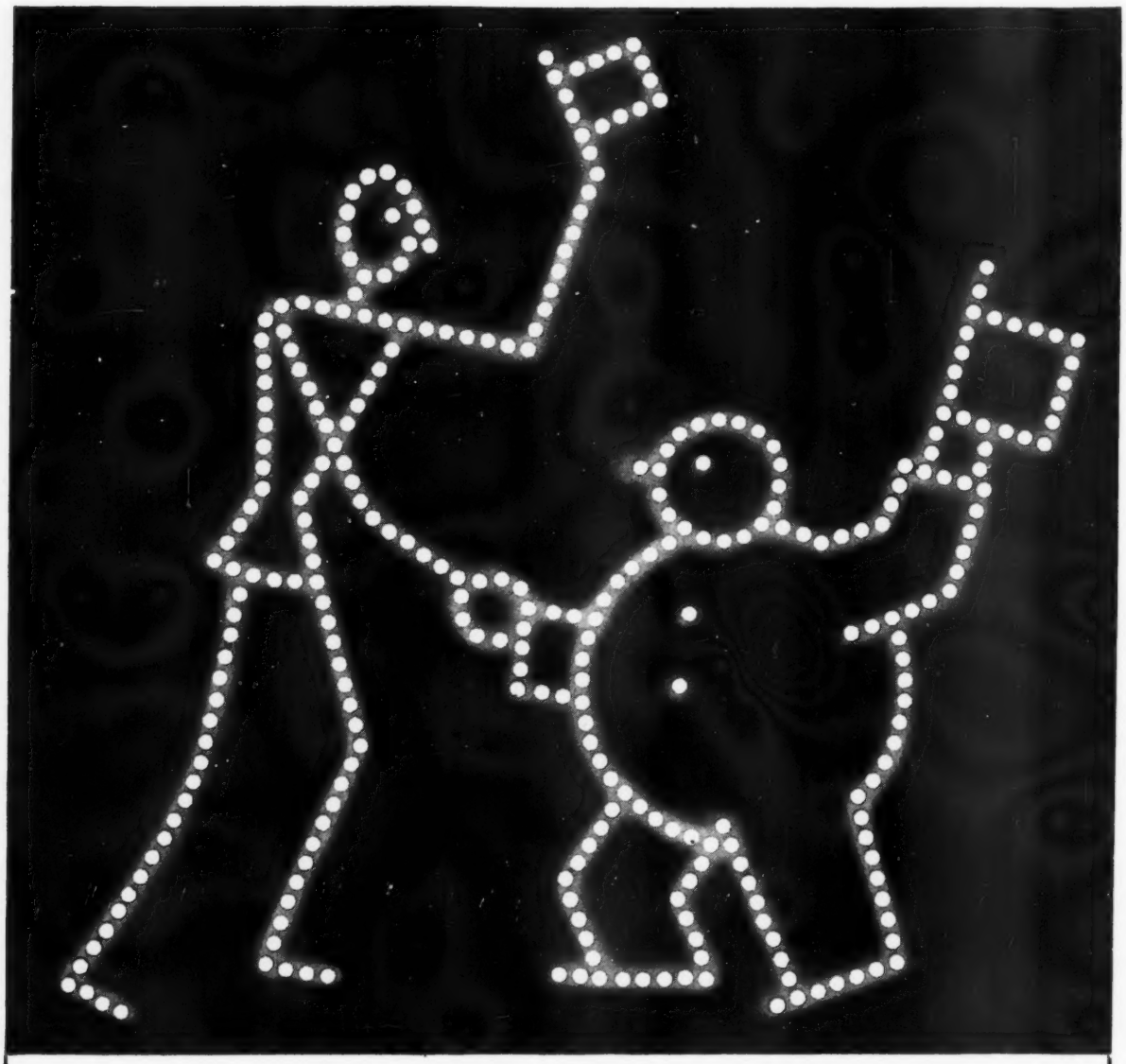

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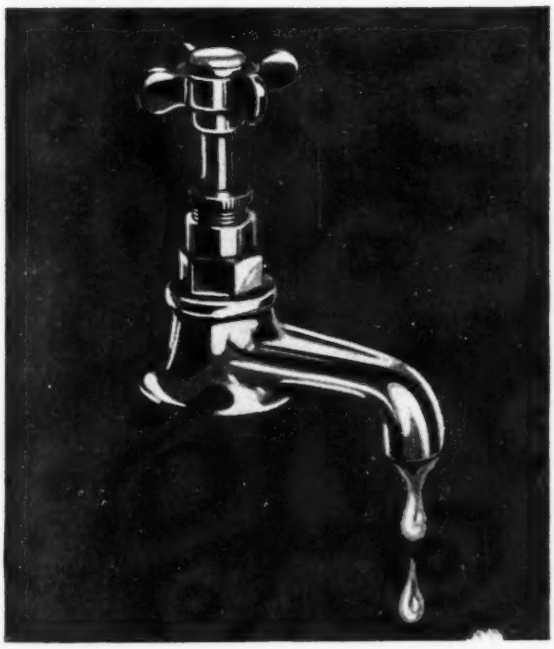

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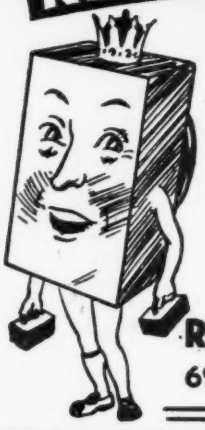

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